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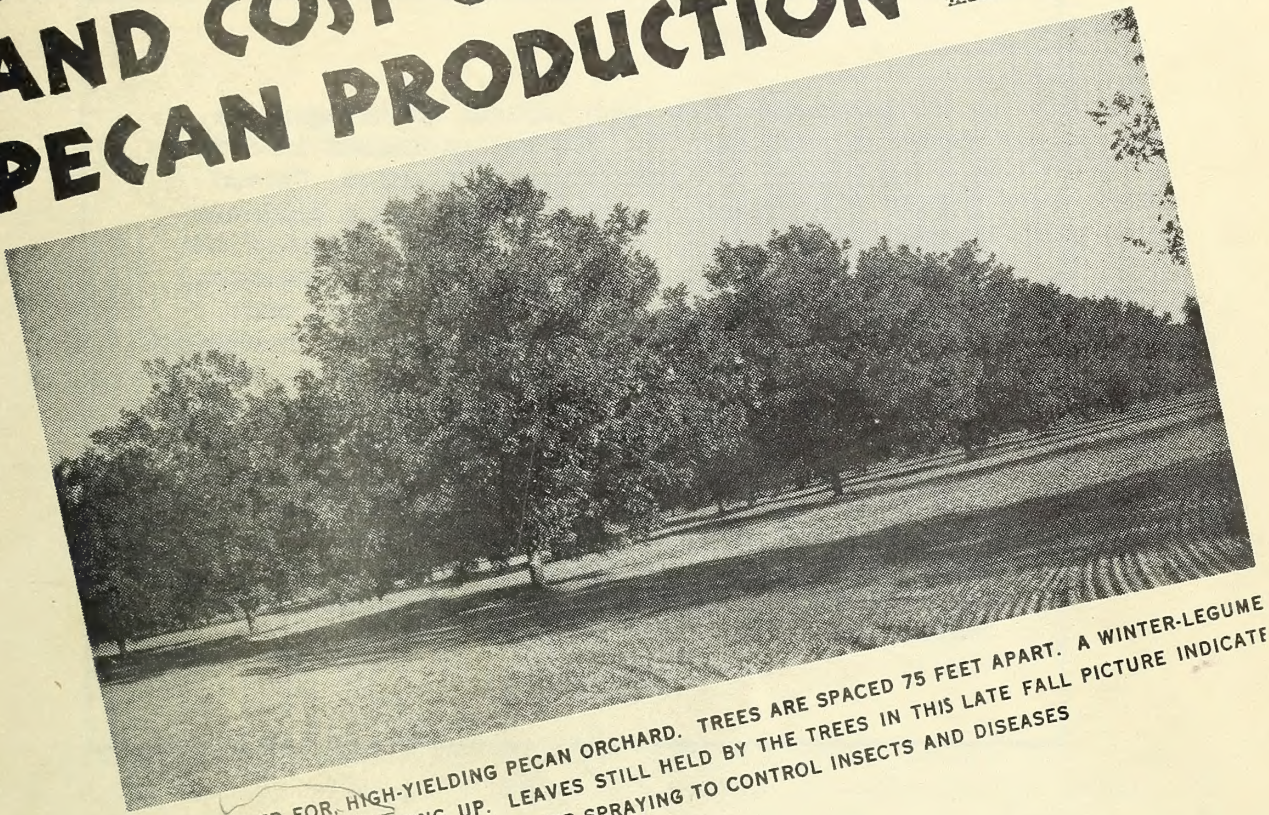
ORCHARD MANAGEMENT AND COST OF PECAN PRODUCTION



A WELL CARED FOR, HIGH-YIELDING PECAN ORCHARD. TREES ARE SPACED 75 FEET APART. A WINTER-LEGUME COVER CROP IS JUST COMING UP. LEAVES STILL HELD BY THE TREES IN THIS LATE FALL PICTURE INDICATE GOOD ORCHARD SANITATION AND PROPER SPRAYING TO CONTROL INSECTS AND DISEASES

By R. S. Washburn
H. L. Crane

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In cooperation with various State agencies, Technical Bulletin No. 324 was published in 1933 by the Bureau of Agricultural Economics, United States Department of Agriculture. This bulletin presented the results of an economic study of the pecan industry from the standpoint of production, management of orchards, production costs, and marketing. The phases regarding orchard management and production costs were prepared by R. S. Washburn and B. H. Thibodeaux of the Bureau of Agricultural Economics. The present report, written by R. S. Washburn of the Bureau of Agricultural Economics and H. L. Crane of the Bureau of Plant Industry, is a revision of those phases of Technical Bulletin No. 324. F. A. Atkinson formerly of the Bureau of Agricultural Economics assisted in the field work.

ORCHARD MANAGEMENT AND COST OF PECAN PRODUCTION

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CONTENTS

Page

Introduction 1
Farms studied 2
Desirability of planting pecan trees at distances that permit a good development of the orchard 7
Control measures for fungus diseases and insect pests 11
Yield of pecans 16
Methods and costs in the development and in the operation of bearing pecan orchards by districts 17
Discussion and conclusions 74

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INTRODUCTION

Native seedling pecans are confined mainly to river valleys and flood plains in the country between the Mississippi River and west central Texas. On the other hand, the commercial production of improved varieties of pecans comes mostly from the East Gulf and South Atlantic Coastal Plains, and the lower Piedmont country from Mississippi to Virginia, although Oklahoma and Texas are increasingly important as producers of improved varieties of pecans.

The data on practices and costs given in this report were obtained in the spring of 1941 by personal interviews with pecan growers in the leading pecan-producing districts of South Carolina, Georgia, Florida, Alabama, Mississippi, and Louisiana (fig. 1). Records on yields and on planting distances of pecan trees obtained in the field were supplemented by information from a mail questionnaire conducted in the above States as well as in North Carolina, Arkansas, Oklahoma and Texas. The data refer to improved varieties only.

Methods and practices in the development of pecan orchards and in the care of bearing orchards have undergone many changes. Planting of orchards decreased materially beginning about 1931. Young orchards as well as those of bearing age received indifferent care. These changes have been largely due to the low farm prices for nuts that have prevailed since 1930 which have not exceeded 14 cents per pound except in 2 years. Many growers realize that pecan trees require as much attention as do other horticultural crops but the low incomes realized from the nuts induced many to neglect their orchards and to discontinue further planting. During the last 4 or 5 years interest in the pecan industry has revived and growers are giving more attention to their orchards -- especially in the wider use of cover crops and in the control of insects and diseases. But except in the western portion of the pecan-producing area, there has been no appreciable planting of new commercial orchards.

This report describes the methods and gives the costs involved in an approved system of orchard development as well as the common method of operating bearing orchards in the several commercial districts studied. It outlines the principles involved in a good system of orchard management, indicates, in a general way, whether these principles are practiced and gives suggestions as to how conditions might be improved.

FARMS STUDIED

Records were obtained on a total of 189 pecan farms located in nine important producing districts, (fig. 1). Small orchards were found in all these districts but a number of the farms studied had several hundred acres, which required the full-time services of the owner or manager and a corps of assistants. Some of the larger pecan farms are operated by companies or individual caretakers who act for absentee owners. The holdings of these absentee owners are usually small; 5-acre tracts are the most common size. In this study a group of these holdings under one management was considered as one farm (table 1). So these farms cannot be said to be typical of individual holdings, as far as size of orchards is concerned. Selection of these farms was advisable because they were found in appreciable numbers in some districts and because it was desirable to interview men who had cared for their orchards for some time. The age of these orchards varied from less than 5 years to more than 30 years.

In the Orangeburg district of South Carolina, much of the pecan production is from small orchards. Family orchards containing a few "back yard" trees requiring little cash outlay are found around nearly every homestead. They are usually not crowded for space, and, grown under a highly favorable environment, they often return a sizable income. The number of commercial orchards in this district is relatively small, and they are commonly operated as a single enterprise in a diversified farming unit that produces cotton, corn, and other field crops. Field crops for harvest, mainly cotton or corn, are usually grown in the young orchard.

Small individual holdings under one management are found most frequently in the Albany district of Georgia. This district is one of the most extensive now producing improved varieties. It is a specialized pecan area and many of the farms studied had all of their crop acreage in pecans; others had a part in pecans, the remainder being planted to such crops as cotton, corn, peanuts,

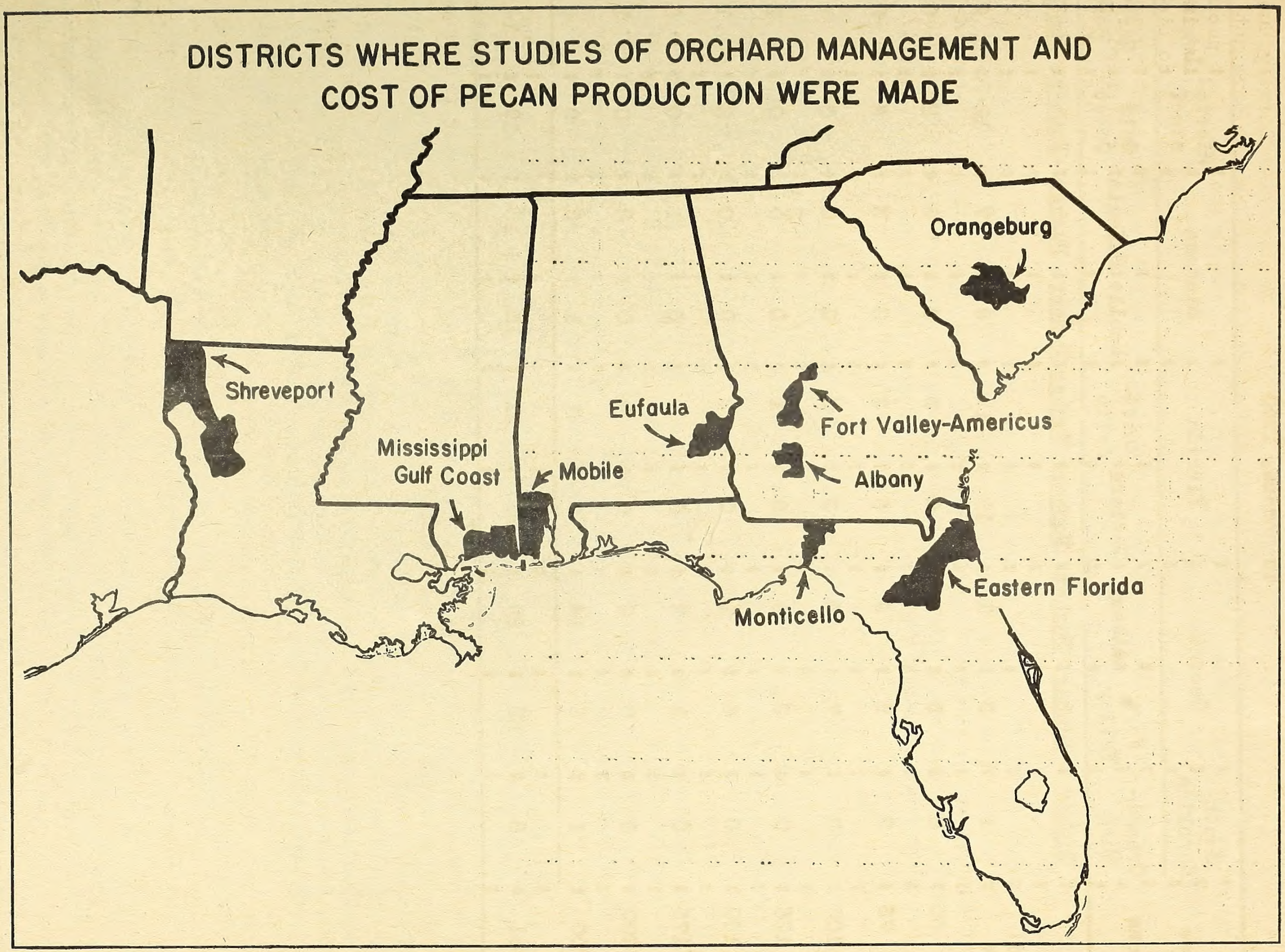

Figure 1.- Orchard management and cost of pecan production studies were made in 9 of the principal districts producing improved varieties of pecans

Table 1.- Number of farms studied, by States, and by acreage in pecans, 1940

Acres in pecans	South Carolina	Georgia		Florida		Alabama		Mississippi	Louisiana
	Orangeburg	Fort Valley	Albany	Eastern	Monticello	Mobile	Eufaula	Gulf Coast	Shreveport
	Number	Number	Number	Number	Number	Number	Number	Number	Number
25 and under	1	3	1	19	11	8	7	12	2
26 - 50	2	5	1	6	3	3	3	2	0
51 - 75	2	5	2	5	3	3	3	3	2
76 - 100	2	7	2	2	0	0	0	0	1
101 - 125	0	2	4	0	1	0	0	0	1
126 - 150	0	6	1	0	2	0	0	2	1
151 - 175	0	1	2	0	0	0	1	0	0
176 - 200	0	0	2	0	0	0	0	0	1
Over 200	1	6	14	0	1	1	2	0	6
Total	8	35	29	32	21	15	16	19	14

and hay. The same crops are usually interplanted in the young orchards of this district.

In the Fort Valley-Montezuma-Americus district, pecan orchards are usually operated in connection with the production of cotton and other field crops. Farms are relatively large and substantial acreages of cotton, corn, and peanuts are grown in young orchards as well as on other acreage not in orchard. In addition, peach orchards of considerable extent are represented. Many pecan orchards were developed with peaches as fillers, but because of complications in spraying and other drawbacks the practice has been mainly discontinued, and pecans and peaches are now planted separately.

In the two Florida district, pecan orchards were largely developed in connection with interplanted crops for harvest during the early stages of tree growth. A large proportion of the pecan farms studied are relatively small, and on many of them the entire crop acreage is planted to pecans. On other farms corn, hay, peanuts, and vegetables are commonly grown on land that is not in orchards.

In the Mississippi Gulf Coast district many of the pecan farms are relatively small and the entire crop acreage is planted to pecans. In the young orchards field crops are usually grown for harvest. On some farms the production of crops on land not in orchards was of some importance, consisting mainly of corn and vegetables.

In the Mobile district of Alabama many of the pecan farms were developed with Satsuma oranges interplanted with the pecan trees, but severe winter freezes have since eliminated the Satsuma. Young orchards now are commonly interplanted with field crops for harvest and, on the larger pecan farms, additional small acreages are grown alone, mainly corn and vegetables.

In the Eufaula district of Alabama and in the Shreveport district of Louisiana, a majority of the pecan farms included in the study not only had crops in the young orchards but also contained a considerable additional acreage of cotton, corn, and hay. In the Eufaula district, peanuts were the frequently interplanted crop. In these districts, crops are commonly grown in bearing orchards under 20 years of age. Generally the acreage of field crops outside of the orchard exceeded the acreage devoted to pecans. These districts and the Orangeburg district of South Carolina and the Fort Valley-Montezuma-Americus district of Georgia represent a type of farming in which pecans are produced in a more or less general farming system with cotton and corn the major farm enterprises.

FERTILE SOILS AND A GOOD SYSTEM OF ORCHARD MANAGEMENT AS FACTORS IN PECAN PRODUCTION

The importance of locating pecan orchards on soils capable of meeting the nutrient requirements of pecan trees cannot be overestimated. Pecan trees thrive best in locations where a long accumulation of vegetable matter has built up a store of humus and nitrogenous material.

Native seedling pecans are confined chiefly to river valleys and flood plains in the area between the Mississippi River and west central Texas on rich alluvial soils that are well supplied with organic matter and plant nutrients. On the other hand, it is estimated that 90 percent of the improved varieties of pecans are grown east of the Mississippi River and northeastward to Virginia on upland soils frequently deficient in organic matter and nitrogen. Pecan trees are gross feeders and only the better drained and more fertile of these upland soils are suited to them. Most of these soils on which these trees are planted are sufficiently well drained and friable so that roots of trees penetrate readily both in the upper surface and subsoil layer of soil. There are exceptions, however, and they will be considered in the discussion of practices in certain of the districts.

For profitable pecan production the fertility of these soils should be built up and the soils should be kept in a fertile stage through soil-improvement practices. This can be accomplished through the use of suitable fertilizers and cover crops. Because of the low level of prices for pecan nuts, it is essential that this should be done at the least possible expense. Growing legumes to be turned under is one of the most economical ways to maintain fertility in these orchards. Summer cover crops recommended in young nonbearing orchards are the various species of crotalaria, velvet beans, and runner peanuts. Neither cowpeas nor soya beans should be grown for they are host plants of the stink bug and other plant bugs which cause pecan kernel spot. Winter cover crops recommended are Austrian winter peas, vetches, blue lupine, Melilotus indica, and small grains. The selection of the cover crop will depend on the locality, the prevalence of disease and the condition of the soil. Leguminous cover crops are to be preferred as they serve the double duty of enriching the soil with nitrogen and adding soil organic matter.

Fertilizers are most effective in pecan orchards when the organic matter of the soil is maintained at a high level. Experience has shown that the most effective way of getting phosphorus and potassium into pecan trees is through the growing of cover crops. When these crops are adequately fertilized the growing plants take up readily the phosphorus and potassium, and when the green matter is returned to the soil these elements are released in such forms that they are absorbed by the pecan trees. Furthermore, the application of phosphorus- and potassium-bearing fertilizers at the time of seeding greatly stimulates cover-crop growth. In most localities the soils are rather acid and it is recommended that applications be made to winter cover crops per acre of one or the other of the following: (1) 500 pounds of basic slag and 50 pounds of 60 percent muriate of potash or its equivalent in other potash salts, or, (2) 300 pounds of 20 percent superphosphate, 300 to 500 pounds of dolomitic lime and 50 pounds of 60 percent muriate of potash or its equivalent in other potash salts. If the soil is of a nonacid nature then only the superphosphate and potash should be used at the rates specified. This practice of increasing the vegetative growth of cover crops through the use of these materials does not entail an added expense to the pecan orchard for if the phosphorus- and potassium-bearing fertilizers are not applied with the cover crop they should be applied around the trees.

In addition to the phosphorus and potassium applied at the time of seeding the cover crop, pecan trees respond, in most cases, to nitrogen applied around them in the early spring about two weeks before the trees begin to grow. This nitrogen may be supplied in the form of nitrate of soda, sulphate of ammonia, cyanamide, or other carriers. In some orchards on highly fertile soils and where heavy yields of leguminous cover crops are produced annually, it may not be necessary or desirable to supply additional nitrogen to the trees in the spring.

The quantity of nitrogen to apply in a pecan orchard depends on several factors such as age of trees, fertility of the soil, cover crops grown, and the condition of the trees. As a general rule an application of about one-fourth pound of nitrate of soda or its equivalent in other forms per year of age of the trees will be adequate for the growth of the trees. If the above program for some good reason cannot be carried out, then 1 or 2 pounds per tree of a standard fertilizer mixture, such as a 6-8-4, should be applied for the first and second year after planting and quantities should be increased as the orchard grows older. A common measure for such standard fertilizers beginning the third year after planting is 2 to 2.5 pounds per tree for each year that the tree is old. Thus a tree 4 years old would receive 465 pounds. For each successive year the quantity per tree would be increased by 2 to 2.5 pounds.

An example of the larger yields of pecans obtained through the **judicious** use of a green-manure crop and commercial fertilizer is found in an experiment conducted on Norfolk fine sandy loam in Jefferson County, over the 3-year period, 1934-36 inclusive, in a Frotscher orchard planted in 1904 and having a stand of 17 trees an acre at the time of the experiment. 1/ The organic matter of the soil was maintained by the use of a leguminous green-manure crop grown in summer and in winter. Plot number 1 received an application of a mixture of 200 pounds of 16 percent superphosphate and 50 pounds of 50 percent sulphate of potash an acre at the time of seeding the winter cover crop. This plot gave a 3-year average yield of 549 pounds of nuts an acre. Plot number 2, which received 250 pounds of superphosphate and potash an acre plus 20 pounds per tree of sulphate of ammonia around the trees in the early spring or a total of 590 pounds of fertilizer an acre, gave an average annual yield of 648 pounds of nuts an acre. A third plot on which no cover crop was grown but which received the same fertilizer and in the same amount as that used on plot number 2, produced only 199 pounds of nuts an acre. This experiment clearly demonstrates the importance of building up and maintaining the organic matter content of the soil in order to realize the greatest benefit from the use of commercial fertilizers.

In addition to fertile soils, suitable fertilizers, and suitable cover crops, a good system of orchard management takes into consideration proper cultural practices and adequate control of diseases and insect pests. These principles of good orchard management are discussed in some detail in connection with the several pecan districts.

DESIRABILITY OF PLANTING PECAN TREES AT DISTANCES THAT PERMIT A GOOD DEVELOPMENT OF THE ORCHARD

There has been a decided tendency to plant pecan trees too close together, although in more recently planted orchards this tendency is not so pronounced as in older ones. Close planting of these trees results in a higher cost for planting stock, an increased cost of planting, and an added cost of carrying the excess trees through the development period. Furthermore, when the trees begin to

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1/ Blackman, G. H., Does Annual Fertilization in a Pecan Orchard Pay? Southeast Pecan Growers Assoc., Pro. 31:20-28, 1937.

crowd, if the excess trees are not removed, the soil is not able to supply moisture and soil nutrients as required and insufficient sunlight causes the lower limbs to die so that large and valuable bearing surfaces are lost. This condition progresses as the crowding increases until finally the trees produce few or no nuts.

There is evidence of too close planting in all districts studied, but this tendency was most pronounced in the East, especially in Florida and in southwest Georgia. Of 1,172 blocks of pecan trees, approximately 36 percent of those that were 20 years old and older were planted at the rate of 18 or more trees to the acre. After a period of 20 or more years, 21 percent of these same trees were still standing, 18 or more to the acre, which is an indication that, although some orchardists have thinned to a lesser stand an acre, many have not yet performed this necessary operation. Of those blocks of trees of nonbearing age (under 10 years) 17 percent were set at the rate of 18 trees or more an acre (table 2).

The variation in the orchards studied was from 2 to 50 (table 3). However, 107 blocks of trees were set 46 2/3 by 46 2/3 feet or 20 to an acre, 129 blocks were set 50 by 50 feet or 17 to an acre, and 299 blocks were set 60 by 60 feet or 12 to an acre. These were the three most common planting distances observed. The age at which pecan trees begin to crowd each other depends on the variety and, to a large extent, on the fertility of the soil. Table 3 shows that, as many of the recent plantings are set too close for the future well-being of the mature orchard, some of these trees should be removed after a few years of bearing life.

For example, an experiment in the Albany district of Georgia 2/ indicated that reducing the number of trees per acre by one-half resulted in increased tree growth and the nuts produced by the more widely spaced trees were larger and better filled than those from the unthinned trees. Furthermore, the 5-year average yield per tree was more than doubled where the trees were thinned. In addition, after thinning, the cost per acre of spray material and fertilizer and the labor of applying them were reduced by about one-half. Thinning the stand of trees by one-half resulted in the production of nuts at a reduced cost per acre and per pound and they sold for a higher price because they were of better quality. Reducing the stand where trees are crowding, however, does not obviate the need of applying fertilizers, of growing cover crops, of spraying, and of adequate cultivation.

The experiment was conducted in a 24-year-old Stuart orchard. Trees planted 46 2/3 by 46 2/3 feet, or 20 to the acre, were thinned to a stand of 10 trees an acre. Trees of the original stand, 20 to the acre, received the same care as those thinned to 10 an acre. All trees had an application of 10 pounds of ammonium sulphate per tree. They received one cultivation a year just before harvest and one Bordeaux spray for the control of foliage diseases.

2/ Hardy, M. B., Loomis, N. H., and Lutz, Harry. Effects of thinning the trees in a pecan orchard. Southeast Pecan Growers Assoc. Pro. 30: 4-9, 1936.

Table 2. - Percentage distribution of blocks of pecan trees by age group, and by number of trees originally planted and number now standing per acre [1]

Number of trees per acre	Trees originally planted			Trees now standing		
	Under 10 years old	10 to 19 years old	20 years old and over	Under 10 years old	10 to 19 years old	20 years old and over
	Percent	Percent	Percent	Percent	Percent	Percent
Under 9	8.3	7.1	5.0	18.0	13.2	13.3
9 - 11	16.7	13.7	8.6	23.2	27.4	21.7
12 - 14	35.5	35.5	24.3	29.8	26.2	20.1
15 - 17	22.4	23.0	25.6	18.9	20.5	23.8
18 - 20	10.5	11.8	19.6	8.8	8.9	12.0
21 - 23	.9	2.7	2.6	0	1.1	2.3
24 - 26	3.5	3.4	5.0	1.3	1.6	3.6
27 - 29	.4	1.2	6.2	0	.4	1.6
Over 29	1.8	1.6	3.1	0	.7	1.6

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[1] Based on 1,172 blocks of trees, each block representing a separate planting (table 3).

Table 3.- Distribution of blocks of pecan trees by age group, and by number of trees originally planted and number now standing per acre 1/

Number of trees per acre	Trees originally planted						Trees now standing					
	1 to 4 years	5 to 9 years	10 to 14 years	15 to 19 years	20 to 24 years	25 years and over	1 to 4 years	5 to 9 years	10 to 14 years	15 to 19 years	20 to 24 years	25 years and over
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
50						1						
48					1							
40			1	1	1							
37											1	
36					2							
35						1						
32											2	
31				1	1	2						
30	1	3	3	3	2	1			3	1		3
29			1	1								
28	1			1		1						
27			3	1	8	15				2	3	3
26				1	2	1				1	1	
25	3	5	8	4	6	7	1	2	3	3	7	4
24			2	4	1	2			1	1		2
23		2				1					1	2
22			4	5	3	6			1		2	3
21			1	5					3	2	1	
20	5	9	21	18	28	26	6	9	15	18	14	10
19	1		2	6	1	3			1	2	1	4
18	4	5	12	7	8	9	2	3	7	7	4	13
17	8	12	27	29	29	24	7	7	19	16	21	11
16	10	4	22	21	16	13	4	4	18	20	15	10
15	6	11	16	14	12	4	8	13	25	17	21	13
14	7	4	12	15	7	6	3	4	13	13	14	16
13	2	5	5	4	4	3	1	3	5	6	5	5
12	23	40	75	88	46	27	22	35	56	54	25	12
11	3	3	12	3	5	3	9	8	20	22	17	13
10	12	15	26	19	11	8	13	17	43	47	22	19
9		5	6	6	3	3	1	5	10	12	6	3
8	4	3	7	5	8	1	4	9	15	14	8	9
7		1	2	1		1		2	4	6	3	3
6	4	3	7	4	3	1	5	4	8	6	6	6
5			7			2	6	4	9	2	3	4
4	1	3	1	6	1	2	4	4	4	6	6	3

1/ Based on 1172 blocks of trees, each block representing a separate planting.

During the first few years of the bearing life of a pecan orchard, or up to the time the trees begin to crowd, a greater production an acre can be anticipated from trees set fairly close together. However, it is doubtful if this added production will more than offset the cost of carrying the excess trees through the development period and the cost of removing them when they begin to crowd. If the trees are planted close together they should be so spaced that those remaining, after some have been removed, will be in a fairly symmetrical arrangement. As there is always the danger that the removal of excess trees will be delayed too long, perhaps the safest course is to begin with trees planted well apart.

CONTROL MEASURES FOR FUNGUS DISEASES AND INSECT PESTS 3/

Some of the fungus diseases affecting the pecan are the vein spot, liver spot, leaf blotch, downy spot and scab. Pecan scab is of the most economic importance, yet all can do severe damage in an orchard. Pecan scab is widely distributed in the pecan producing area and affects the leaves, twigs, and nuts of the tree, with by far the greatest injury to the nuts. It is most serious in districts of high humidity, high temperature, and frequent summer rains and therefore causes most damage in the territory embracing northern Florida, and the southern portions of Georgia, Alabama, Mississippi, Louisiana, and Texas. Most varieties are susceptible to scab; but in a section where the fungus thrives, infection depends on whether or not there is a strain or race of the fungus capable of attacking the variety grown. Susceptible varieties may appear immune for a limited period in isolated orchards, or even over extensive areas, and later succumb to the disease when a suitable strain of the causal organism is introduced and becomes established. 3/

Does it Pay to Top-work Pecan Trees to Control Scab?

Formerly many cultivated varieties of pecan such as Teche, Curtis, Moneymaker, Russell, Stuart, and Frotscher were thought to be highly resistant to scab infection. As a matter of fact, the degree of susceptibility to scab infection of the different varieties is approximately in the order named: Delmas, Halbert, Georgia, Burkett, Schley, Alley, Pabst, Van Deman, Success, Frotscher, Moneymaker, Mobile, Moore, Nelson, Curtis, Teche, and Stuart. Recent observations indicate that the scab fungus is becoming of economic importance on varieties formerly thought to be highly resistant. As the effective control of this disease is very important to the pecan industry, the widely followed practice of top-working susceptible varieties to so-called nonsusceptible varieties may need to be abandoned and other methods of control adopted. The cost of top-working to so-called nonsusceptible varieties and the time required for the top-worked trees to come into commercial bearing are items for close consideration. So many factors enter that it is difficult to make a reasonable estimate of this cost. Estimates indicate that the total cost of top-working, including necessary later care, will approximate $1.50 for each inch in diameter of the top-worked tree. The length of time before top-worked trees come into bearing again depends on several conditions, but it is safe to say that the new top will begin bearing

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3/ Quoted portions of this section have been taken from U.S.D.A. Farmers' Bulletin 1829, "Insects and Diseases of the Pecan and their Control", 1940, which should be referred to for additional information regarding the nature and control of these insects and diseases.

in from 2 to 5 years and will yield a commercial crop in 6 to 8 years.

Proper Orchard Care as a Factor in Disease Control

"The vigor of pecan trees and more especially the severity of the attack of leaf-destroying fungi are the most important factors that determine whether the leaves will remain on the trees and retain their functioning powers during the summer and the greater part of the autumn, or whether they will become spotted and drop during August, September and October. There is a very intimate association between some of the foliage diseases and lack of tree vigor caused by improper care of the orchard. Hence, methods of correcting the condition by improved orchard management cannot be too greatly emphasized. Trees in bearing orchards that have been fertilized, cultivated frequently enough to keep down weed growth, and well cared for otherwise, especially if they have been properly sprayed, will carry their foliage in excellent condition until the first freeze."

"On the other hand, trees in neglected, crowded, uncultivated orchards in which weeds, grasses, and brambles are allowed to take possession of the soil and compete with the trees for moisture, nitrogen, and other food-forming elements, are the first to lose their leaves. The functioning power of leaves on such trees is greatly reduced after about the first of August owing to severe spotting by foliage-destroying fungi. Trees in the condition just described start growth slowly in the spring because of low food reserves resulting from poor foliage during the previous years and, further, because of the depletion of nitrogen or other essential elements in the soil through the weeds and grass that start growth earlier in the spring than does the pecan. Trees growing in such unfavorable environment cannot be expected to show any improvement or increased production of nuts; instead they will gradually decline in vigor from year to year."

The fungus causing pecan scab overwinters in the diseased areas of the shoots, shucks, leaf stems and leaves, whereas the fungi that cause the various leaf spot diseases, liver spot, downy spot, brown leaf spot, vein spot, blotch, and others live over winter in the old diseased leaves. In early spring when the trees begin to leaf out, fungus spores are produced in these old infected materials. These spores are discharged into the air and when they fall on the new leaves or in the case of scab on the shoots or nuts they cause new infections. Thus the disease is carried over from year to year. If the orchard were completely free of this old diseased material there would be little new infection except that coming from the shoots infected with the pecan scab fungus. The importance of disposing of all of this old and diseased material can be well understood and cannot be overemphasized.

In late winter, after rains when the old shucks and leaf stems that remain on the tree are damp, the trees should be gone over and all of this material knocked off onto the ground. Such material is easily removed at that time by jarring the branches or tapping the old shucks or leaf stems with a bamboo pole. After this has been done all of this material should be cleanly raked from under the trees into the tree row middles where it can be turned under with a turning plow and all of it placed so deeply beneath the surface that it would not be uncovered by later cultivation. This plowing should be done before the trees start growth. Good orchard sanitation, combined with spraying and other proper orchard management practices, will control the common and most destructive foliage diseases.

Does it Pay to Spray Pecans?

In areas where scab and other fungus diseases are prevalent, spraying susceptible varieties is essential to save the pecan crop. If there are indications that a heavy crop is set in the spring, spraying these varieties may mean the difference between no crop and a full crop.

Spraying is the most effective means of controlling the insects and fungus diseases that attack pecan nuts directly or that cause foliage injury and reduce the yield indirectly. But the expense of spraying will not be justified if the trees are low in productivity because of neglect, crowding, or poor fertility of the soil. For spraying to be done economically, the spray must be applied on vigorous trees that are kept in good condition by spraying and good cultural management of the orchard.

The impression prevails in many sections that the cost of spraying is prohibitive. The estimate of the cost as shown in table 4 should serve to refute this assumption. On the basis of 15- to 19-year-old trees, set 60 by 60 feet or 12 to the acre, about $13.50 an acre was necessary for one application of a 4-1-100 Bordeaux mixture and for three applications of a 6-2-100 Bordeaux mixture plus 13 ounces of nicotine sulphate in the second cover spray, and 4 ounces of nicotine sulphate in the third cover spray (table 4). On a tree basis the cost per season is about $1.10 for spraying. With pecans selling at 12 cents a pound, about 9 pounds of nuts per tree would pay for a season's spraying. On the farms visited in 1941 the practice of spraying was not followed to any extent except in the Fort Valley-Montezuma-Americus district of Georgia and in the Orangeburg district of South Carolina. On most farms in these districts only the Schley variety was sprayed.

Results of an experiment conducted in the Albany district of Georgia clearly demonstrates the beneficial effects of carrying out an adequate spray program to control the scab disease. 4/ Trees of the Schley variety planted 46 2/3 by 46 2/3 feet, or 20 to the acre in 1910, were thinned in February 1936 to a stand of 10 trees an acre. Over the 5-year period, 1935-39 inclusive, these trees received an annual pre-pollination 4-1-100 Bordeaux mixture spray and 3 applications of a 6-2-100 Bordeaux mixture cover or summer spray. Trees in the unsprayed check plots received the same care in regard to cultivation, cover crops, and fertilization.

The experiment showed that the sprayed trees produced a yield nearly 400 percent greater than the unsprayed trees. Over the 5-year period the average annual yield of sprayed trees was 51 pounds per tree as compared with an average annual yield of 11 pounds a tree for the unsprayed ones. In addition, the nuts from the unsprayed trees graded U. S. No. 2; they were small, poorly filled, averaged 101 nuts to the pound, and sold for 7 cents per pound. On the other hand, the nuts from the sprayed trees graded U. S. No. 1, averaged 68 nuts per pound, and sold at 15 cents per pound. Evidently, these control measures may be

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4/ Cole, J. R. and Large, J. R., Resume of five years spraying of pecans with low-lime Bordeaux mixture to control scab and foliage diseases. Southeast Pecan Growers Assoc., Pro. 34: 16-23, 1940.

Table 4.- Cost per acre per season of spraying 15- to 19-year-old pecan trees, set 12 to the acre, according to a common method and at cost rates prevailing in 1940.

Item	Quantity	Cost per acre
Size of sprayer - 300 gallons		
Usual labor crew and power	Number	
Men	2	
Tractor	1	
Kind of spray		
Bordeaux mixture		
Number of applications	4 1/	
	Gallons	
Application per tree (1 time)	20	
Application per acre (4 times)	960	3.34
Application per day	2,000	
Nicotine sulphate	Pounds	
Application per acre	2.55	2.55
Labor and power	Hours	
Man labor @ 12½ cents per hour	9.60	1.20
Tractor work @ 60 cents per hour	4.80	2.88
Sprayer use @ 75 cents per hour	4.80	3.60
Total		13.57

1/ Based on 1 application of a 4-1-100 and on 3 applications of 6-2-100 Bordeaux mixture with 13 ounces of nicotine sulphate in the second spray and 4 ounces of nicotine sulphate in the third spray. Copper sulphate valued at 6 cents, lime at 1 cent, and nicotine sulphate at $1 per pound.

practiced to advantage.

A sprayer equipped with a motor capable of developing from 15 to 20 horsepower and having a pump capacity of from 25 to 35 gallons per minute and a tank holding 300 gallons is as small as can be recommended. A sprayer of this size is adequate to spray from 50 to 75 acres of pecan orchard. On larger acreages it is preferable that the sprayer should have a motor capable of developing from 25 to 40 horsepower, a pump capacity of from 35 to 50 gallons per minute, and a tank holding 400 gallons. Contract spraying has become rather common in certain parts of Georgia; growers with small acreages may find it advantageous to have their spraying done on a contract basis or own this equipment in partnership with neighbors.

Control Measures for Pecan Insects

Among the various insects that attack the pecan and cause damage, the pecan leaf case-bearer, the pecan nut case-bearer, the black pecan aphid, and the hickory shuckworm are of major economic importance; in limited localities the obscure scale and pecan weevil are also rather important.

The pecan leaf case-bearer occurs in very serious numbers in orchards in the southern part of the pecan-growing area extending from Florida to Texas. This insect does not attack the nuts directly but it destroys many blossom buds in the spring. As the initial activity of the larva of this insect in the spring is confined to the terminal and lateral buds after differentiation has taken place, the damage they do plays an influential part in reducing yields. Pecan growers annually use considerable quantities of calcium arsenate in the control of this insect. This insecticide is used at the rate of 1 pound to 50 gallons of a 6-2-100 Bordeaux mixture. Under no circumstances should calcium arsenate be used without Bordeaux mixture, as more or less serious injury to the foliage or nuts is likely to result if it is used alone. Only one thorough application, early in July, is necessary. On varieties that do not scab a 2-1-100 Bordeaux mixture is sufficient to prevent arsenical injury to pecan foliage.

Pecan nut case-bearers have been reported as destroying from one-third to three-fourths of the total pecan crop in various localities in Texas. The insect is also common in Florida, Georgia, Alabama, Mississippi, and Louisiana, damaging from 5 to 40 percent of the crop each year. Nicotine sulphate is recommended for use in its control in all areas except western Texas where lead arsenate is commonly used.

In humid areas a high degree of control has been obtained through the use, usually in late May or early June, of one or two applications of a spray composed of 13 fluid ounces of nicotine sulphate, 3 quarts of mineral oil emulsion or 1 quart of fish oil in each 100 gallons of water. If control of scab is necessary, this insecticide may be used with a 6-2-100 Bordeaux mixture. Under semiarid conditions in Texas the application of 6 pounds of lead arsenate in 100 gallons of water has been effective. Lead arsenate is injurious to foliage under humid conditions and is not recommended except in semiarid or arid climates.

Black pecan aphids, like other plant lice, feed upon the sap which is sucked up through the beak thrust into the tissues of the leaf. The damage caused by these aphids is difficult to estimate. In times of serious infestation there is undoubtedly a drain which interferes with the proper functioning of the tree. Coupled with this, the premature defoliation resulting from the feeding of the aphids has a tendency to result in unfilled and undeveloped nuts. Nicotine sulphate, 40 percent, is recommended for the control of the aphid. This insecticide is applied at the rate of 4 ounces per 100 gallons of 6-2-100 Bordeaux mixture when pecan scab is also present or with a summer oil emulsion (2 quarts per 100 gallons of water). It is usually applied at the time of the third cover spray for pecan scab.

The hickory shuckworm occurs in practically every section of the pecan belt. Mining or tunneling of the shucks often results in improper development of the nut kernels and prevents the natural separation of the shucks from the nutshells. Nuts infested by the shuckworm are often undersized and are usually later in maturing than are those that are free from this pest. The damage is not restricted to the matured nuts, for when the larvae enters the small green nuts it causes them to drop. Much of the drop of pecans during June, July and August is due to the damage caused by this insect. Injury of this type is not so noticeable as that caused in the fall, but it should not be minimized, for investigations have shown that it plays no small part in the reduction of the nut crop. As the insects pass the winter as larvae in the shucks, one means of aiding control are sanitary measures such as gathering and disposing of all shucks after harvest and of turning them under with a turning plow.

YIELD OF PECANS

Economical yields are the basis of successful crop production and should be the goal of every orchardist. Unlike annual crops, pecan trees cannot readily be taken on trial and then discontinued if the results do not meet expectations. As a pecan orchard represents a considerable investment and requires several years of care before it gives any returns, it must be so planted and cared for that it will produce enough nuts to return a profit to the grower. Pecan yields, however, are now so highly uncertain under the methods of production used in most areas that the grower may have serious financial problems. But with a program of good orchard management, disease and insect control, crop yields would be much more certain.

There is much misunderstanding about the yields reasonably to be expected from pecan orchards. The phenomenal yield from some individual tree is frequently used in estimating the potential returns from a prospective orchard. For example, individual trees, having the advantage of unusually favorable growing conditions, have been known to yield in excess of 500 pounds of nuts in a single year. The enthusiastic planner, hearing of this, is prone to think that an extensive commercial orchard, producing nuts in proportion to the model tree according to its age, would be a good thing to own. As trees planted in orchards rarely yield in proportion to isolated trees under highly favorable environment, such individual tree records should not be taken as a basis for estimating potential returns from commercial plantings. Rather, a person who plans to set out a pecan orchard should estimate his potential returns from the results being obtained in well-cared-for orchards of fairly good size in the community in which he expects to plant.

Pecan trees may bear a few nuts when 3 to 5 years old but, generally speaking, orchards of varieties now commonly planted do not come into commercial bearing until they are at least 10 years old (table 5). With proper care the trend in yield should then be upward for several years as the orchard grows older. This increase is by no means a fixed ratio, as yields depend not only on the age of the trees but on soil, climatic conditions, variety, crowding of the trees, insects and disease present, and orchard management practices followed.

There is a wide range in yields between pecan orchards. An array by States, based on the 5-year 1936-40 average yield per tree of orchards of bearing age, is shown in table 6. These yield figures serve as illustrations of variation in production from orchard to orchard. Few of the orchards had high yields. For all States, over a period of years, from 39 to 74 percent of the orchards fell in the group having a yield of less than 10 pounds per tree.

Yields per tree of pecan orchards of bearing age by States for the 5-year period 1936-40 are shown in table 7. These yield data give additional examples of the low yields of bearing pecan trees in most States. In the Western States the high variability in yield from year to year indicates the "off and on" years of production that result from unseasonable weather, insects, and diseases.

METHODS AND COSTS IN THE DEVELOPMENT AND IN THE OPERATION OF BEARING PECAN ORCHARDS, BY DISTRICTS

The practices and expenditures in terms of physical quantities and money used in the development of a pecan orchard are based on an approved method of development and are not necessarily those now practiced by growers. Very few orchards have been planted in recent years and sufficient data were not available to set up standards on the method of development as now practiced. But the growing of interplanted field crops for harvest was a common practice in all districts studied. These crops are grown for feed and for cash income from the orchard land while the trees are still in the development stage.

Total costs of bringing a pecan orchard into bearing age show considerable variation between districts. This variation is due to several factors such as wages of man labor, horse-work rates, use of fertilizer, and especially the amount of the joint costs that are charged to pecans.

Pecan trees require a fertile productive soil; if intercropping is practiced to offset to some extent the expense during the development period, a proper rotation of crops with frequent use of legumes should be followed, together with the use of generous applications of commercial fertilizer. Thus the fertility of the soil will be not only maintained but gradually built up and put in condition to produce large yields of pecans. The ultimate object is a healthy, normal orchard. If this development is not unduly hindered by growing interplanted crops for harvest, and if a pecan grower is in a position to use to advantage the products grown in the orchard, or if he can find a ready sale at a profit for these products, he may well reduce production costs appreciably by interplanting during the first few years or until the additional space is needed for the future well-being of the orchard.

The present tendency to plant pecan trees greater distances apart than formerly is a further reason why intercropping during the development period may be practiced without serious detrimental effects. Care should be exercised in not growing other crops too close to the trees.

Table 5.- Average yield of pecans per tree, by States, in 672 orchards during the 5-year period, 1936-40, showing age of trees as of March 1941 1/

Age of trees (Years)	North Carolina		South Carolina		Georgia		Florida		Alabama	
	Orchards	Yield per tree	Orchards	Yield per tree	Orchards	Yield per tree	Orchards	Yield per tree	Orchards	Yield per tree
	Number	Lbs.	Number	Lbs.	Number	Lbs.	Number	Lbs.	Number	Lbs.
Under 10	16	5.0	6	6.2	1	.8	2	3.8	6	.4
10 to 14	55	6.7	13	6.2	32	7.9	3	9.7	15	4.1
15 to 19	34	12.6	30	13.2	42	9.9	12	6.6	23	6.8
20 to 24	16	9.2	14	14.2	23	8.7	8	12.8	14	8.1
25 to 29	14	6.6	8	16.3	14	10.8	10	9.6	13	16.1
30 and over	3	11.0	1	13.2	2	2.0	3	1.5	3	6.3

Age of trees (Years)	Mississippi		Louisiana		Arkansas		Texas		Oklahoma	
	Orchards	Yield per tree	Orchards	Yield per tree	Orchards	Yield per tree	Orchards	Yield per tree	Orchards	Yield per tree
	Number	Lbs.	Number	Lbs.	Number	Lbs.	Number	Lbs.	Number	Lbs.
Under 10	14	.1	9	.7	5	.3	22	2.5	11	2.6
10 to 14	31	8.6	3	17.3	12	4.4	10	4.2	5	12.
15 to 19	19	5.6	10	10.0	1	4.7	10	2.9	2	20.
20 to 24	16	3.5	12	15.4	3	12.9	3	4.0	0	0.0
25 to 29	17	12.7	8	14.2	2	21.4	2	4.4	1	12.8
30 and over	4	17.4	3	56.0	0	0	1	3.9	0	0

1/ In computing average yields per tree for this table, average production for the 5-year period was divided by number of trees reported as of March 1941. This procedure involves the assumption that each orchard had the same number of trees in each of the 5-seasons as was reported in March 1941, which is not strictly true, for in some instances changes occurred in the number of trees in a given group due to tree mortality and removals, but these averages are believed to be fairly indicative of the yields in these orchards during this period.

Table 6.- Distribution of 1033 pecan orchards of bearing age, by States, according to the 5-year (1936-40) average yield per tree 1/

Average yield per tree	North Carolina	South Carolina	Georgia	Florida	Alabama
Pounds	Number	Number	Number	Number	Number
0-4.9	43	19	37	15	28
5-9.9	31	25	42	12	29
10-14.9	40	19	48	13	21
15-19.9	21	16	22	4	12
20-24.9	19	9	13	5	6
25-29.9	14	6	7	3	9
30-34.9	3	4	12	1	5
35-39.9	2	4	3	4	4
40-44.9	5	4	0	1	4
45-49.9	1	1	0	0	3
50 and over	3	6	3	5	5
Total	182	113	187	63	126

Average yield per tree	Mississippi	Louisiana	Arkansas	Texas	Oklahoma
Pounds	Number	Number	Number	Number	Number
0-4.9	43	10	9	29	2
5-9.9	49	18	6	24	9
10-14.9	28	7	5	5	6
15-19.9	14	7	1	3	2
20-24.9	10	5	1	3	2
25-29.9	6	6	0	1	0
30-34.9	6	3	1	3	0
35-39.9	6	1	1	1	0
40-44.9	5	2	1	0	0
45-49.9	1	3	0	1	0
50 and over	5	8	0	2	1
Total	173	70	25	72	22

1/ In computing average yields per tree for this table, average production for the 5-year period was divided by the number of trees reported as of March 1941. This procedure involves the assumption that each orchard had the same number of trees in each of the 5 seasons as was reported in March 1941, which is not strictly true, for in some instances, changes occurred in the number of trees in a given group due to tree mortality and removals, but these averages are believed to be fairly indicative of the yields in these orchards during this period.

Table 7.- Average yield of pecans per tree by States for trees of bearing age in 1033 orchards for the 5-year period 1936-40 1/

State	Reports	1936 yield per tree	1937 yield per tree	1938 yield per tree	1939 yield per tree	1940 yield per tree	5-year weighted average yield per tree
	Number	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
North Carolina	182	12.8	12.6	14.0	6.8	8.8	11.0
South Carolina	113	14.9	14.6	11.8	11.1	15.4	13.5
Georgia	137	9.3	7.9	8.1	6.6	13.3	9.0
Florida	63	11.4	10.3	10.4	11.6	6.8	10.1
Alabama	126	8.2	9.7	8.9	11.6	6.4	8.9
Mississippi	173	7.0	11.1	6.1	9.8	3.1	7.5
Louisiana	70	13.8	22.3	14.4	10.0	27.6	17.6
Arkansas	25	8.9	12.8	4.2	10.8	4.1	8.2
Texas	72	2.5	8.9	3.1	9.4	12.9	7.4
Oklahoma	22	3.9	7.9	6.7	11.6	14.5	8.9

1/ In computing average yields per tree for this table, the reported production was divided by the number of bearing trees (trees 10 years old and older) reported in March 1941. This procedure involves the assumption that each orchard had the same number of bearing trees in each of the 5 seasons as was reported in March 1941, which is not strictly true, for in some instances, trees came into bearing and/or died during the 5-year period, but these averages are believed to be fairly indicative of the average yields in these orchards during this period, since tree mortality would tend to be offset by trees reaching bearing age during the period.

The cost of developing pecan orchards for the first 10 years was used to represent the cost of bringing an orchard into bearing age. No credit was given for the value of nuts produced during this period. In some districts some production before the eleventh year can be anticipated, especially from early bearing varieties, but such production from most varieties is not of commercial importance.

Cost estimates for bearing orchards are based on a common method of orchard management for orchards 15 to 19 years of age. The majority of the bearing orchards were of this age. Notwithstanding great variations in methods and practices, each district has a rather common method of orchard management on which the cost estimates for bearing orchards are based.

After the orchard comes into commercial bearing the interplanting of field crops for harvest is discontinued in most districts and pecan production is then given the entire consideration. The exceptions are the Eufaula district of Alabama and the Shreveport district of Louisiana, where interplanted crops for harvest are commonly grown in bearing orchards under 20 years of age.

Where field crops are grown in the orchard for harvest, only a part of the cost of such items as preparation of the land and cultivation of the total orchard acreage and of the cost of taxes and of interest on the investment was charged to the pecan orchard. The basis for such charges was the extent of the land area used by the trees. This method assumes that the growing of interplanted cash and feed crops reduces the cost of certain items involved in developing the trees and in producing the nuts, in proportion to the land area used by crops grown in the orchard. This is an arbitrary and not altogether satisfactory basis for distributing these costs, but it is the best that could be used under the existing circumstances.

Cost of producing an acre previous to harvest is a more stable figure than cost of production per pound of nuts. Irrespective of whether a crop is produced, the orchard receives a certain degree of care, which in many cases does not differ materially from year to year. Provided the general system of management remains constant, the cost per acre previous to harvest will differ only slightly from year to year except as changes occur in the prices paid for labor, power, and materials.

The total cost of production per acre and per pound takes into consideration the cost of harvesting and the common method of disposal of the nuts, and varies mainly with the yield. During the year of the study (1940) conditions were relatively favorable for pecan production in most States. Obviously the yields for that year do not represent a fair basis in all cases for calculating production costs per pound of nuts. For this reason yield data were obtained for a series of years and the costs per acre and per pound are given on the basis of a 5-year average yield; with them are given the yields that are necessary to pay production costs if the nuts are sold at State average prices received by growers in 1940. The costs as shown are based on prices paid for labor, materials, and other items in that year.

Explanation of Items

Labor and power rates.-- Charges for man labor are based on prevailing local rates for labor hired by the day in 1940. Rates for horse work are based on the estimated cost of keeping work stock. Charges for use of tractors and motortrucks are based on the estimated cost of operating tractors and motortrucks.

Supervision.-- Supervision refers to the labor of a general supervisory nature performed by the owner or hired manager. This labor was charged at double the rate for ordinary labor.

Materials.-- Such items as trees, commercial fertilizer, manure, cover-crop seed, and spray materials were charged at cost if purchased, and at farm value if produced on the farm.

Orchard sanitation.-- Orchard sanitation includes such operations as knocking off scab-infected leaves and shucks, disposal of girdled twigs and limbs, destroying web worms, and the like.

Rate of work per day.-- The term "rate of work per day" refers to the amount of work done per day on the basis of the entire orchard acreage and accounts for the relatively large number of "orchard acres" covered a day for such operations as cultivating tree rows and applying fertilizer around trees, where only a portion of the actual orchard space is covered.

Reserve for orchard depletion.-- A charge for depletion of the orchard based on its bearing life is usually included in a study of orchard costs. As the production of improved varieties of pecans has been under way for so short a time that no one knows the bearing life of an improved pecan orchard, no charge for orchard depletion is included here. There are records, however, of seedling pecan trees more than 100 years old that are still bearing. If improved varieties have as long a period of bearing life as seedlings, this charge obviously would be almost negligible.

Overhead.-- Overhead includes a charge for items of general farm maintenance such as building and fence repairs, general farm insurance, and miscellaneous cash and labor items used in operating the farm. In this study overhead was estimated as amounting to 15 percent of the cost of labor, power, and materials used in pecan production.

Interest.-- During the development period, interest was figured for a specific year at prevailing rates on the previous year's development costs and on the original value of that portion of the land occupied by the trees, and on the value of the machinery used in developing the orchard. The interest charge for bearing orchards was figured on the total computed cost of developing an orchard into bearing, plus interest on the value of that portion of the land occupied by the trees, and on the value of machinery used in operating the bearing orchard. For orchards bought, interest should be computed on the price paid. Orchards in some districts may sell for less than the cost per acre as computed in this study.

Use of Machinery.-- Machinery costs include depreciation and repairs for tillage implements and other machinery used in handling orchards, excluding tractors and motor trucks. The charge for horse drawn tillage implements was estimated at 3 cents per horse hour used and tractor drawn tillage implements at 12 cents per tractor hour used. Sprayer charge was estimated at 75 cents an hour of use.

Taxes.-- The tax charge is a pro rata share of the 1940 land tax; the part charged to pecans is in proportion to the value of the land used by the pecan trees. In general, the young orchards are assessed at the same value as land of the same grade without trees.

The following text and tables briefly summarize practices and costs of developing a pecan orchard to commercial bearing age and the annual cost of operating an orchard of bearing age, for each of the districts studied. In considering these costs, the reader should keep in mind that a considerable portion of the cost of developing an orchard and of producing pecans does not represent an actual out-of-pocket cost. In many instances much of the work is performed by the pecan grower and his family. On farms where there are enterprises other than pecans, much of the labor, implements, and power used in developing and caring for a pecan orchard represent increased use of items not fully employed by other farm enterprises and hence is not additional actual cost to the farmer. The purchase price of the land itself is, of course, to be considered as a significant part of the initial cost of development and operation of bearing pecan orchards.

These considerations are of prime importance to those who contemplate the development of a pecan orchard. In most cases the man who can develop and operate an orchard to best advantage and at lowest significant cost is the one who does it as a part of his own farming business. The contrary is true of orchards under the management of caretakers where the operations are often performed at contract rates. In such cases, the total cost of developing and operating the orchard, aside from the use of land, normally represents an actual cash outlay.

South Carolina

Orangeburg District

Orchards studied in the Orangeburg district of South Carolina are in Orangeburg and Calhoun Counties. The cost of developing a pecan orchard in this district is set up on the basis of farm crops for harvest grown in the orchard during the entire development period. Cotton (alternated with corn) is grown up to, but not including, the tree row for the first 4 years. Beginning with the fifth year a free space is allowed on each side of the tree row. These tree-row spaces have a total width of approximately 16 feet from the fifth to the seventh years and 24 feet for the next 3 years and are cultivated independently of the interplanted crop. The remainder of the space is usually cropped in cotton or corn.

In the spring the orchard acreage is plowed and planted to field crops. Following an application of fertilizer around the trees in the spring the interplanted crops and trees are cultivated with one-horse cultivators. After the fourth year the free tree-row space is cultivated with disk harrows drawn with tractor power. In the fall, after the preparation of a seedbed with the disk harrow, a winter cover crop of hairy vetch or Austrian peas is planted. During the first 10 years of growth, a total of about 69 man hours, 21 horse hours, and 14 tractor hours are used to plant and fertilize the trees, cultivate, prune, and care for the trees. At rates prevailing in 1940, the labor and power costs for the first 10 years amounted to about $20 an acre (table 8).

Pecan-orchard land was valued at about $50 an acre in 1940. Trees for planting 60 feet each way cost $9 an acre (12 trees at 75 cents each). The cost of trees, labor and power, fertilizer, cover-crop seed, and other items chargeable to the trees, plus the value of the land on which the trees were set, amounted to about $65 an acre for the first year. After the first year the annual cost increased from about $4 an acre in the second year to almost $11 an acre in the tenth year. At the end of 10 years the total cost, including interest on the investment compounded annually, and $50 for land amounted to $129.16 an acre (table 9).

The growing of field crops for harvest in the orchard is not common after the young orchard comes into commercial bearing. Different methods were employed in the management of bearing orchards. The use of cover crops in bearing orchards was common. Vetch was used in a mixture of small grains, either oats or rye. Contrary to good practice because of likelihood of damage due to kernel spot, in some orchards a summer cover crop of cowpeas or soybeans was planted. Some orchards were grazed.

The bearing-orchard management program as shown in table 10 provides for plowing the orchard acreage in the spring, clean cultivation during the summer, and seeding a winter cover-crop mixture of oats and vetch in the fall. Fifty-seven percent of the bearing trees included in the study, all of which were of the Schley variety, were sprayed from two to four times. Under this system of orchard management and with a 5-year average yield of 155 pounds of nuts an acre, about 3.5 days of man labor, slightly less than 0.5 day of horse work, and about 0.5 day of tractor work were used in the care and harvest of an acre of nuts.

The total cost of producing an acre of pecans, exclusive of interest, was approximately $16 an acre and 10 cents per pound; including interest it was about $22.50 an acre and 14.5 cents per pound (table 11). On the basis of the State average farm price of 14 cents per pound, the 5-year average yield for the district was 43 pounds in excess of the quantity necessary to cover the cost an acre exclusive of interest, but it was 6 pounds less than the quantity necessary to cover the cost an acre inclusive of interest. Production records for 28 orchards of bearing age showed a 5-year average yield that ranged from less than 1 pound to 55 pounds per tree. Sixty-eight percent of these orchards had yields sufficient to cover costs an acre excluding interest charges. Forty-three percent had yields sufficient to cover costs an acre including interest charge.

Commercial orchards in this district are relatively few. These pecan orchards are composed chiefly of Schley and Stuart varieties. They are located on soils that are well suited to pecan production but there is an apparent need to improve the methods of management followed in some orchards.

The growing of a summer cover crop of cowpeas or soybeans, which is done by some growers, is not a good practice, as they are host plants to the stink bug and other plant bugs that cause kernel spot.

Table 8.- South Carolina, Orangeburg district: Labor and power cost per acre of developing a pecan orchard during the first 10 years, according to an approved method 1/ and at cost rates prevailing in 1940

Operation	Years operation is performed	Labor and power			Rate of work per day 2/	Times done each year	Percentage charged to pecans	Charged to pecans			Cost
		Man	Horse	Tractor				Man labor	Horse work	Tractor work	
		Number	Number	Number	Orchard acres	Number	Percent	Hours	Hours	Hours	Dols.
Plow	1st-10th inc.	1		1	7.5	1	3/13-40	3.5		3.5	2.53
Harrow (disk)	Do.	1		1	16	1	3/13-40	1.6		1.6	1.16
Plant:											
Set stakes	First	3			25	1	100	1.2			.12
Dig holes	Do.	2			6	1	100	3.3			.33
Set trees	Do.	3	2		10	1	100	3.0	2.0		.54
Apply fertilizer around trees	2nd-4th inc.	3	2		45	1	100	2.1	1.2		.35
	5th & 6th	3	2		40	1	100	1.6	1.0		.28
	7th & 8th	3	2		35	1	100	1.8	1.2		.32
	9th & 10th	3	2		30	1	100	2.0	1.4		.36
Cultivate	1st & 3rd	1	1		3	6	3/ 13	5.2	5.2		1.14
	2nd & 4th	1	1		3.5	3	3/ 13	2.2	2.2		.48
Cultivate tree rows (disk harrow)	5th-7th inc.	1		1	45	3	100	2.1		2.1	1.52
	8th-10th inc.	1		1	30	3	100	3.0		3.0	2.17
Hoe around trees	1st-4th inc.	1			15	2	100	5.2			.52
Harrow (disk-fall)	1st-10th inc.	1		1	16	1	3/13-40	1.6		1.6	1.16
Drill in cover crop seed and fertilizer	1st-10th inc.	2		1	15	1	3/13-40	3.5		1.9	1.57
Prune	2nd-10th inc.						100	5.8			.58
Remove pruned wood	5th-10th inc.						100	2.8	5.6		.95
Supervision	1st-10th inc.						100	10.3			2.57
Miscellaneous 4/	Do.						100	7.0	1.1		.83
Total								68.8	20.9	13.7	19.48

1/ Based on trees set 60 by 60 feet or 12 to the acre and on cotton alternated with corn grown up to but not including the tree row for the first 4 years. Tree-row spaces have a total width of about 16 feet for the following 3 years, and 24 feet for the next 3 years. Tree-row space is cultivated independently from the fifth to the tenth years; rest of the space usually cropped in cotton or corn.

2/ See p. 22 for definition of "Rate of work per day."

3/ Charges for land preparation and seeding of cover crop prorated to pecan trees on basis of the land area used by the trees. Charges to pecan tree are as follows: First 4 years, 13 percent; following 3 years, 27 percent; and next 3 years, 40 percent. Percentage charge to pecan trees for cultivation are the same as for land preparation for the first 4 years and 100 percent from the fifth to the tenth years.

4/ Includes orchard sanitation and replacing missing trees.

Table 9.- South Carolina, Orangeburg district: Cost per acre of developing a pecan orchard for the first 10 years, by years, according to an approved method and at cost rates prevailing in 1940

Item	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
Fertilizer around trees pounds		8	16	24	32	40	48	56	64	7
Labor and power:										
Man labor hours	14.8	6.0	7.6	6.0	5.3	5.2	5.3	6.0	6.2	6.
Horse work do.	4.6	1.7	3.2	1.7	1.5	1.4	1.5	1.7	1.7	1.
Tractor work do.	.5	.5	.5	.5	1.7	1.7	1.7	2.2	2.2	2.
Labor and power:	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.
Man labor 1/	1.82	.75	.95	.75	.69	.68	.69	.79	.81	.8
Horse work 1/	.55	.20	.38	.20	.18	.17	.18	.20	.20	.2
Tractor work 1/	.30	.30	.30	.30	1.02	1.02	1.02	1.32	1.32	1.3
Total	2.67	1.25	1.63	1.25	1.89	1.87	1.89	2.31	2.33	2.3
Materials:										
Trees @ 75¢ each	9.00									
Fertilizer around trees @ $36 per ton		.14	.29	.43	.58	.72	.86	1.01	1.15	1.3
Fertilizer for cover crop @ $15 per ton 2/ 5/	.20	.20	.20	.20	.40	.40	.40	.60	.60	.6
Cover crop seed: 3/ 5/										
Hairy vetch @ 10¢ per pound	.26		.26		.54		.54		.80	
Austrian winter peas @ 5¢ per pound		.20		.20		.40		.60		.6
Miscellaneous 4/	.25	.65	.30	.25	.20	.18	.15	.15	.12	.1
Total	9.71	1.19	1.05	1.08	1.72	1.70	1.95	2.36	2.67	2.6
Other costs:										
Taxes 5/	.04	.04	.04	.04	.08	.08	.08	.12	.12	.1
Use of machinery 6/	.20	.11	.16	.11	.25	.25	.25	.32	.32	.3
Overhead 6/	1.86	.37	.40	.35	.54	.54	.58	.70	.75	.7
Total	2.10	.52	.60	.50	.87	.87	.91	1.14	1.19	1.1
Total cost, exclusive of interest	14.48	2.96	3.28	2.83	4.48	4.44	4.75	5.81	6.19	6.2
Interest @ 5 percent 5/ 6/	.38	1.10	1.31	1.53	2.13	2.46	2.81	3.53	3.99	4.5
Total cost	14.86	4.06	4.59	4.36	6.61	6.90	7.56	9.34	10.18	10.7
Cost of development at end of each year 7/	64.86	68.92	73.51	77.87	84.48	91.38	98.94	108.28	118.46	129.1

1/ Ordinary labor charged at 10 cents, tractor operator at 12½ cents, supervision at 25 cents, horse work at 12 cents, and tractor work at 60 cents an hour.

2/ Based on 16 percent superphosphate applied for winter cover crop at the rate of 200 pounds an acre.

3/ Based on hairy vetch alternated with Austrian winter peas: Hairy vetch seeded at the rate of 20 pounds and Austrian winter peas at the rate of 30 pounds an acre.

4/ Includes trees for replanting and other miscellaneous materials.

5/ Charges for fertilizer for winter cover, cover-crop seed, taxes, and interest prorated to pecan trees on the basis of the land area used by the trees. These charges to pecan trees are: First 4 years, 13 percent; following 3 years, 27 percent; and the next 3 years, 40 percent.

6/ See page 22 for method of computing machinery, overhead, and interest charges.

7/ Total cost including interest plus initial value of land, at $50 an acre.

Table 10.- South Carolina, Orangeburg district: Annual labor and power cost per acre of operating pecan orchards 15 to 19 years old 1/ with a yield of 155 pounds per acre according to a common method and at cost rates prevailing in 1940 2/

Operation	Labor and power: Man	Labor and power: Horse	Labor and power: Tractor	Rate of work per day	Times done	Man labor	Horse work	Tractor work	Cost
	Number	Number	Number	Orchard acres	Number	Hours	Hours	Hours	Dollars
Plow	1		1	7.5	1	1.3		1.3	.94
Cultivate (disk harrow)	1		1	16.0	3	1.9		1.9	1.38
Drill cover crop seed	1		1	15.0	1	.7		.7	.51
Harvest: 3/									
Thresh and pick				4/		16.6			5/1.55
Haul to storage dry and sack						2.7	2.3		6/ .55
Haul to market (5 miles)						.2			7/ .07
Supervision						5.3			1.32
Miscellaneous 8/						6.4	1.2	1.3	1.59
Total						35.1	3.5	5.2	7.91

1/ Trees set 60 by 60 feet or 12 to the acre. There is now about 93 percent of a full stand.

2/ Ordinary labor charged at 10 cents, tractor operator at 12½ cents, supervision at 25 cents, horse work at 12 cents, and tractor work at 60 cents an hour.

3/ Based on pecans sold to local or other wholesale buyers and delivered to local shipping point.

4/ Pecan trees are usually threshed 1 time and the orchard is gone over about 3 times in picking up nuts. Threshing is at the rate of 20 trees per man per day, and picking at an average rate of 140 pounds per man per day.

5/ Based on a contract rate of 1 cent per pound for threshing trees and picking up nuts.

6/ Based on 1.75 man hours and 1.5 horse hours per 100 pounds of pecans produced.

7/ Based on use of motor truck at 10 cents per mile, and on 1 man hauling 3,000 pounds of pecans per load or 9,000 pounds per day.

8/ Includes 1.5 man hours and 0.5 horse hours for pruning and removing pruned wood 3.8 man hours and 1.3 tractor hours for spraying, and 1.1 man hour and 0.7 horse hours for applying commercial fertilizer and manure.

Table 11.- South Carolina, Orangeburg district: Annual cost of operating pecan orchards 15 to 19 years old 1/ according to a common method and at cost rates prevailing in 1940

Item	Quantity per acre	Cost per acre
	Pounds	Dollars
Yield per acre	155	
Labor and power:		
Preharvest	Hours	
Man labor	12.1	1.61
Horse work	1.2	.14
Tractor work	5.2	3.12
Total		4.87
Harvest 2/		
Man labor	23.0	2.71
Horse work	2.3	.28
Truck work		.05
Total		3.04
Materials:	Bushels	
Winter cover crop; oats	1	.50
	Pounds	
vetch	12	1.20
	Number	
Sacks	1.55	.08
Miscellaneous 3/		2.31
Total		4.09
Other costs:		
Taxes		.30
Use of machinery, not including tractor or truck 4/		1.61
Overhead 4/		1.80
Total		3.71
Total cost, exclusive of interest		15.71
Interest at 5 percent 4/		6.86
Total cost		22.57
		Cost per pound
Cost per pound, exclusive of interest		.101
Cost per pound, inclusive of interest		.146
Quantity of nuts at 14 cents per pound 5/ required to cover cost per acre	Pounds	
Exclusive of interest	112	
Inclusive of interest	161	

1/ Trees set 60 by 60 feet or 12 to the acre. There is now about 93 percent of a full stand.

2/ Based on pecans sold to local or other wholesale buyers and delivered to local shipping point.

3/ Includes $1.36 for spray material, and $0.95 for commercial fertilizer and manure.

4/ See p. 22 for method of computing machinery, overhead, and interest charges.

5/ The 1940 State average farm price.

The turning under of a green-manure crop such as Austrian winter peas or vetch is preferable to the common practice of growing a winter cover crop of a mixture of vetch and a small grain which in some cases is pastured by livestock. In addition, a more systematic use of commercial fertilizer around the trees and in connection with a leguminous green-manure crop to maintain the nutrient requirements of the pecan tree could be adopted with profit by growers not now following this practice.

All or a part of the pecan trees of the Schley variety were sprayed from two to four times in 50 percent of the orchards studied. Because of the seriousness of pecan diseases more growers may find it necessary to spray susceptible varieties if they are to obtain satisfactory yields.

Georgia

Fort Valley-Montezuma-Americus District

The orchards studied in this district are in Peach, Macon, and Sumter Counties. The system of orchard development for this district provides for field crops for harvest to be interplanted in the young orchard during the entire development period. It is based on cotton alternated with peanuts and corn grown and cultivated with winter cover crops and progressively more tree space just as in the Orangeburg district of South Carolina.

In the spring the orchard acreage is plowed and planted to field crops. Fertilizer is applied around the trees and is worked in during the first 4 years with one-horse cultivators at the time of the first cultivation of the interplanted crop. After the fourth year, when a free space is allowed on each side of the tree row, the fertilizer is worked in with disk harrows. In the fall, after the harvest of the interplanted crop, the orchard acreage is disked and a winter cover crop of hairy vetch or Austrian winter peas is planted.

The quantity and cost of labor and power during the development period are shown in table 12. In 1940, pecan-orchard land was valued at about $50 an acre. At the end of 10 years the total cost, including interest compounded annually and $50 for land, amounted to $130 an acre (table 13).

Growing of interplanted crops for harvest is not common in bearing orchards of this district. Seventy-five percent of the growers visited used a winter cover crop, consisting of Austrian winter peas, or hairy vetch, or mixtures of small grains and vetch, mainly vetch and oats. Four growers had a part of their acreage in lespedeza which was grazed. An equal number followed a winter cover with a summer cover of velvet beans, cowpeas, or soybeans. These summer covers were grazed or the beans or peas were picked and the vines turned under.

Austrian winter peas or hairy vetch used separately were the most common winter covers. A common program for bearing-orchards provides for disking the winter cover crop under in the spring, clean cultivation during the summer, and the seeding of a winter cover of Austrian winter peas in the fall. Forty-one percent of the bearing trees included in the study were sprayed from one to six times. Seventy-six percent of the sprayed trees were of the Schley variety. Under this system of orchard management and with a 5-year average yield of 190 pounds of nuts an acre, about 4 days of man labor and slightly less than 0.5 day

Table 12. - Georgia, Fort Valley-Montezuma-Americus district: Labor and power cost per acre of developing a pecan orchard during the first 10 years, according to an approved method 1/ and at cost rates prevailing in 1940

Operation	Years operation is performed	Labor and power			Rate of work per day 2/	Times done each year	Percentage charged to pecans	Charged to pecans			Cost
		Man	Horse	Tractor				Man labor	Horse work	Tractor work	
		Number	Number	Number	Orchard acres	Number	Percent	Hours	Hours	Hours	Dollars
Plow	1st-10th inc.	1		1	7.5	1	3/13-40	3.5		3.5	2.54
Harrow (disk)	do.	1		1	16	1	3/13-40	1.6		1.6	1.16
Plant:											
Set stakes	First	3			25	1	100	1.2			.12
Dig holes	do.	1			3.5	1	100	2.9			.29
Set trees	do.	3	2		10	1	100	3.0	2.0		.54
Apply fertilizer around trees	2nd-4th inc.	3	2		45	1	100	2.1	1.2		.35
	5th & 6th	3	2		40	1	100	1.6	1.0		.28
	7th & 8th	3	2		35	1	100	1.8	1.2		.32
	9th & 10th	3	2		30	1	100	2.0	1.4		.37
Cultivate	1st & 4th	1	1		3	6	3/13	5.2	5.2		1.15
	Second	1	1		15	4/ 2	3/13	.2	.2		.04
	Second	1	1		3	4/ 3	3/13	1.3	1.3		.29
	Third	1	1		3.5	3	3/13	1.1	1.1		.24
Cultivate tree rows (disk harrow)	5th-7th inc.	1		1	45	3	100	2.1		2.1	1.52
	8th-10th inc.	1		1	30	3	100	3.0		3.0	2.18
Hoe around trees	1st-4th inc.	1			15	2	100	5.2			.52
Harrow (disk-fall)	1st-10th inc.	1		1	16	1	3/13-40	1.6		1.6	1.16
Apply fertilizer for cover crop	do.	3	2		14	1	3/13-40	5.7	3.8		1.03
Seed cover crop	do.	1			20	1	3/13-40	1.3			.13
Disk in cover-crop seed	do.	1		1	16	1	3/13-40	1.6		1.6	1.16
Prune	2nd-10th inc.						100	5.8			.58
Remove pruned wood	6th-10th inc.						100	3.2	3.2		.70
Supervision	1st-10th inc.						100	11.1			2.78
Misc. 5/	do.						100	6.2	1.0		.74
Total								74.3	22.6	13.4	20.19

1/ Based on trees set 60 by 60 feet or 12 to the acre and on cotton alternated with peanuts and corn for harvest grown up to but not including the tree row for the first 4 years; Tree-row spaces have a total width of about 16 feet for the following 3 years and 24 feet for the next 3 years. Tree-row space is cultivated independently from the fifth to the tenth year; rest of space usually cropped in cotton, peanuts or corn.

2/ See p. 22 for definition of "Rate of work per day."

3/ Charges for land preparation and seeding of cover crop prorated to pecan trees on the basis of the land area used by the trees. These charges to pecan trees are: First 4 years, 13 percent; following 3 years, 27 percent; and the next 3 years, 40 percent. Percentage charges to pecan trees for cultivation are the same as for land preparation for the first 4 years and 100 percent from the fifth to the tenth years.

4/ Based on 2 cultivations with a weeder and 3 cultivations with a single stock.

5/ Includes orchard sanitation and replacing missing trees.

Table 13.- Georgia, Fort Valley-Montezuma-Americus district: Cost per acre of developing a pecan orchard for the first 10 years, by years, according to an approved method and at cost rates prevailing in 1940

Item		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
Fertilizer around trees	pounds		8	16	24	32	40	48	56	64	72
Labor and power:											
Man labor	hours	14.6	6.8	6.2	8.1	5.3	5.8	6.1	6.9	7.2	7.7
Horse work	do.	4.8	2.3	1.9	3.3	1.0	1.6	1.7	1.9	2.1	2.0
Tractor work	do.	.5	.5	.5	.5	1.7	1.7	1.7	2.1	2.1	2.1
		Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.
Labor and power:											
Man labor 1/		1.80	.84	.77	1.00	.69	.76	.79	.89	.94	.95
Horse work 1/		.58	.28	.23	.40	.12	.19	.20	.23	.25	.24
Tractor work 1/		.30	.30	.30	.30	1.02	1.02	1.02	1.26	1.26	1.26
Total		2.68	1.42	1.30	1.70	1.83	1.97	2.01	2.38	2.45	2.45
Materials:											
Trees @ 75¢ each		9.00									
Fertilizer around trees @ $36 per ton			.14	.29	.43	.58	.72	.86	1.01	1.15	1.30
Fertilizer for cover crop @ $15 per ton 2/ 5/		.20	.20	.20	.20	.40	.40	.40	.60	.60	.60
Cover crop seed: 3/ 5/											
Hairy vetch @ 10¢ per pound		.26		.26		.54		.54		.80	
Austrian winter peas @ 5¢ per pound			.20		.20		.40		.60		.60
Miscellaneous 4/		.30	.60	.30	.25	.20	.18	.15	.12	.15	.12
Total		9.76	1.14	1.05	1.08	1.72	1.70	1.95	2.33	2.70	2.62
Other costs:											
Taxes 5/		.04	.04	.04	.04	.08	.08	.08	.12	.12	.12
Use of machinery 6/		.20	.13	.12	.16	.23	.25	.26	.31	.32	.31
Overhead 6/		1.87	.38	.35	.42	.53	.55	.59	.71	.77	.76
Total		2.11	.55	.51	.62	.84	.88	.93	1.14	1.21	1.19
Total cost, exclusive of interest		14.55	3.11	2.86	3.40	4.39	4.55	4.89	5.85	6.36	6.26
Interest @ 5 percent 5/ 6/		.38	1.10	1.31	1.53	2.14	2.48	2.83	3.55	4.03	4.54
Total cost		14.93	4.21	4.17	4.93	6.53	7.03	7.72	9.40	10.39	10.80
Cost of development at end of each year 7/		64.93	69.14	73.31	78.24	84.77	91.80	99.52	108.92	119.31	130.11

1/ Ordinary labor charged at 10 cents, tractor operator at 12 cents, supervision at 25 cents, horse work at 12 cents, and tractor work at 60 cents an hour.

2/ Based on 16 percent superphosphate applied for cover crop at the rate of 200 pounds an acre.

3/ Based on hairy vetch alternated with Austrian winter peas: Hairy vetch seeded at the rate of 20 pounds and Austrian winter peas at the rate of 30 pounds an acre.

4/ Includes trees for replanting and other miscellaneous material.

5/ Charges for fertilizer for cover crop, cover crop seed, taxes, and interest prorated to pecan trees on the basis of the land area used by the trees. These charges to pecan trees are: First 4 years, 13 percent; following 3 years, 27 percent; and the next 3 years, 40 percent.

6/ See p. 22 for method of computing machinery, overhead, and interest charges.

7/ Total cost including interest plus initial value of land at $50 an acre.

each of horse work and of tractor work were used in the care and harvest of an acre of nuts (table 14).

The total cost exclusive of interest amounted to approximately $18 an acre and 9.5 cents per pound; including interest at 5 percent it was about $25 an acre and 13 cents per pound (table 15).

The 5-year average yield obtained, selling at the 1940 farm price of 12.2 cents per pound, was 43 pounds in excess of the quantity necessary to cover the cost an acre excluding interest, but it was 14 pounds less than the quantity necessary to cover the acre cost including interest. Production records for 31 orchards of bearing age (10 years old and older) showed a 5-year average yield that ranged from 8.1 pounds to 37.4 pounds to the tree. Seventy-four percent of these orchards had yields sufficient to cover costs excluding interest charges, and 52 percent had yields sufficient to cover costs including interest charges.

A majority of the pecan orchards in this district are located on fertile soils and were set at distances that permit a good development of the trees. Of a total of 50 blocks of trees, 15 years old and older in 1941, 64 percent were set at the rate of less than 17 trees an acre and 40 percent were set at the rate of 12 or less.

Many pecan growers have extensive peach orchards. They are equipped to do spraying and the practice of spraying pecan orchards was more extensive than in other districts studied.

Disease and insect pests have not been a serious problem in this district until recent years. Now that they are becoming a limiting factor, more pecan orchardists need to give attention to their control if production is to be maintained. The results of spraying experiments discussed on page   illustrate the desirability of spraying done at the right time and in the correct way.

For the most part, pecan growers in this district are applying improved orcharding practices. However, the factors of particular importance that should be given attention are a more widespread adoption of a spraying program, a more extensive use of fertilizer around the trees and the growing of a leguminous green-manure crop.

Albany District

The majority of the orchards studied in the Albany district of Georgia are in Dougherty County; a few are in the counties of Lee and Mitchell. In this district too the cost of developing a pecan orchard is based on field crops for harvest in the orchard during the entire development period with the cropping system comparable to the Fort Valley-Montezuma-Americus District. Following an application of fertilizer around the trees, the interplanted crops, cotton alternated with peanuts and corn, are cultivated with one-horse cultivators, the trees receiving the same cultivation as that given the interplanted crop. For the remainder of the development period the free space on each side of the tree row is cultivated independently with tractor-drawn disk harrows. In the fall following the preparation of the soil with a disk harrow, a winter cover crop of hairy vetch alternated with Austrian winter peas is planted.

Table 14.- Georgia, Fort Valley-Montezuma-Americus district: Annual labor and power cost per acre of operating pecan orchards 15 to 19 years old 1/ with a yield of 190 pounds per acre according to a common method and at cost rates prevailing in 1940 2/

Operation	Labor and power			Rate of work per day	Times done	Man labor	Horse work	Tractor work	Cost
	Man	Horse	Tractor						
	Number	Number	Number	Orchard acres	Number	Hours	Hours	Hours	Dollars
Disk cover crop under	1		1	16	1	.6		.6	.44
Cultivate (disk harrow)	1		1	16	3	1.9		1.9	1.38
Seed cover crop	1			20	1	.5			.05
Disk in cover crop seed	1		1	16	1	.6		.6	.44
Harvest: 3/									
Thresh and pick				4/		19.1			5/1.90
Haul to storage, dry and sack						3.3	2.8		6/ .67
Supervision						5.9			1.47
Miscellaneous 7/						7.2	1.2	1.7	1.92
Total						39.1	4.0	4.8	8.27

1/ Trees set 60 by 60 feet or 12 to the acre. There is now about 92 percent of a full stand.

2/ Ordinary labor charged at 10 cents, tractor operator at 12½ cents, supervision at 25 cents, horse work at 12 cents, and tractor work at 60 cents an hour.

3/ Based on pecans sold at the farm to local or other wholesale buyers.

4/ Pecan trees are usually threshed 1 time, and the orchard is gone over about 3 times in picking up nuts. Threshing is at the rate of 20 trees per man per day, and picking at an average rate of 140 pounds per man per day.

5/ Based on a contract rate of 1 cent per pound for threshing trees and picking up nuts.

6/ Based on 1.75 man hours and 1.5 horse hours per 100 pounds of pecans produced.

7/ Includes 3.9 man hours and 1.7 tractor hours for spraying, 1.8 man hours and 1.2 horse hours for applying fertilizer and 1.5 man hours for pruning and orchard sanitation.

Table 15.- Georgia, Fort Valley-Montezuma-Americus district: Annual cost of operating pecan orchards 15 to 19 years old 1/ according to a common method and at cost rates prevailing in 1940

Item	Quantity per acre	Cost per acre
	Pounds	Dollars
Yield per acre	190	
Labor and power:		
Preharvest	Hours	
Man labor	12.7	1.68
Horse work	1.2	.14
Tractor work	4.8	2.88
Total		4.70
Harvest 2/		
Man labor	26.4	3.23
Horse work	2.8	.34
Total		3.57
Materials:	Pounds	
Winter cover crop, Austrian winter peas @ 5 cents per pound	30	1.50
	Number	
Sacks	1.9	.10
Miscellaneous 3/		3.89
Total		5.49
Other costs:		
Taxes 4/		.30
Use of machinery, not including tractor		1.85
Overhead 4/		2.06
Total		4.21
Total cost, exclusive of interest		17.97
Interest at 5 percent 4/		6.97
Total cost		24.94
		Cost per pound
Cost per pound, exclusive of interest		.095
Cost per pound, inclusive of interest		.131
Quantity of nuts at 12.2 cents per pound 5/ required to cover cost per acre	Pounds	
Exclusive of interest	147	
Inclusive of interest	204	

1/ Trees set 60 by 60 feet or 12 to the acre. There is now about 92 percent of a full stand.

2/ Based on pecans sold at farm to local or other wholesale buyers.

3/ Includes $2.50 for commercial fertilizer and $1.39 for spray material.

4/ See p. 22 for method of computing machinery, overhead, and interest.

5/ The 1940 State average farm price.

During the first 10 years of growth a total of about 90 man-hours, 22 horse hours, and 16 tractor hours are used to plant, fertilize, cultivate, seed cover crop, prune, and care for the trees. At rates prevailing in 1940, the labor and power costs amounted to about $24 an acre (table 16). In that year, pecan-orchard land was valued at about $20 an acre. Trees for planting 46 feet 8 inches each way cost $15 an acre (20 trees at 75 cents each). The cost of trees, labor and power, fertilizer, cover-crop seed, taxes, interest, and other items chargeable to the trees, plus the value of land on which the trees were planted amounted to about $43 an acre for the first year. After that, the annual cost increased from about $5 an acre in the second year to almost $14 an acre in the tenth year. At the end of 10 years, the total cost, including interest on the investment compounded annually, and $20 for land amounted to $123.65 an acre (table 17).

The growing of field crops for harvest in the orchard is not common when young orchards come into commercial bearing. Bearing orchards in this district are operated in several ways. Sedge grass has become firmly established in many of them and the attention given is mainly confined to mowing the sedge grass one or two times during the season. Other orchards are grazed, the pasture being native grasses or a cover crop seeded for that purpose. Although many orchards are receiving no care or very indifferent care rather a large proportion receive cultivation and have an annual cover crop. In the orchards that are receiving some attention it is common to give clean cultivation during the summer and plant a winter cover crop of hairy vetch or Austrian winter peas in the fall, to be plowed under the following spring.

The care of an acre of bearing orchard in the Albany district, including the harvest of about 85 pounds of nuts an acre, takes the equivalent of approximately 3 days of man labor, 0.3 days of horse work, and 0.4 days of tractor work per year (table 18). The total cost of producing an acre of pecans exclusive of interest amounted to about $12.30 an acre and 14.5 cents per pound; including interest at 5 percent it was approximately $18.50 an acre and 22 cents per pound (table 19). The 5-year average yield of 85 pounds of pecans an acre, selling at the 1940 farm price, was 16 pounds less than the quantity necessary to cover the cost an acre exclusive of interest and 68 pounds less than the quantity necessary to cover the cost an acre including interest. Production records obtained through personal visits and through the use of mailed questionnaires furnished information regarding yields for 30 orchards representing a total of 83,573 trees of bearing age. The distribution of orchards according to the 5-year average yield per tree was as follows:

Yield per tree in pounds	Number of orchards
1 - 3.9	12
4 - 7.9	10
8 - 11.9	1
12 - 15.9	6
16 and over	1

Seventy-three percent of the orchard owners reported yields under 8 pounds per tree and 40 percent reported yields under 4 pounds per tree as indicated in the distribution shown. On an acre basis, approximately 67 percent of the entire group of orchards failed to produce enough nuts per acre to cover costs, exclusive of interest charges; and 73 percent did not have yields sufficient to cover costs including interest charges.

Table 16. - Georgia, Albany district: Labor and power cost per acre of developing a pecan orchard during the first 10 years, according to an approved method 1/ and at cost rates prevailing in 1940

Operation	Years operation is performed	Labor and power			Rate of work per day 2/	Times done each year	Percentage charged to pecans	Charged to pecans			Cost
		Man	Horse	Tractor				Man labor	Horse work	Tractor work	
		Number	Number	Number	Orchard acres	Number	Percent	Hours	Hours	Hours	Dollars
Plow	1st-10th inc.	1		1	7.5	1	3/17-51	4.4		4.4	3.19
Harrow (disk)	do.	1		1	16	1	3/17-51	1.9		1.9	1.38
Plant:											
Lay off rows	First	1	1		30	1	100	.3	.3		.07
Set stakes	do.	3			35	1	100	.9			.09
Dig holes	do.	1			1.5	1	100	6.7			.67
Set trees	do.	7	2		12	1	100	5.8	1.7		.78
Apply fertilizer around trees	2nd-4th inc.	3	2		40	1	100	2.4	1.5		.42
	5th & 6th	3	2		35	1	100	1.8	1.2		.32
	7th & 8th	3	2		30	1	100	2.0	1.4		.37
	9th & 10th	3	2		25	1	100	2.4	1.6		.43
Cultivate	1st & 4th	1	1		3	6	3/17	6.8	6.8		1.50
	Second	1	1		15	4/ 2	3/17	.2	.2		.04
	Second	1	1		3	4/ 3	3/17	1.7	1.7		.37
	Third	1	1		3.5	3	3/17	1.5	1.5		.33
Cultivate tree rows (disk harrow)	5th-7th inc.	1		1	35	3	100	2.7		2.7	1.96
	8th-10th inc.	1		1	25	3	100	3.6		3.6	2.61
Hoe around trees	1st-4th inc.	1			10	2	100	8.0			.80
Harrow (disk-fall)	1st-10th inc.	1		1	16	1	3/17-51	1.9		1.9	1.38
Drill in cover crop seed and fertilizer	do.	2		1	15	1	3/17-51	4.4		1.9	1.63
Prune	2nd-10th inc.						100	5.8			.58
Removed pruned wood	6th-10th inc.						100	3.2	3.2		.70
Supervision	1st-10th inc.						100	13.5			3.38
Miscellaneous 5/	do.						100	8.2	1.1		.95
Total								90.1	22.2	16.4	23.95

1/ Based on trees set 46 2/3 by 46 2/3 feet or 20 to the acre and on cotton alternated with peanuts and corn for harvest grown up to but not including the tree row for the first 4 years. Tree-row spaces have a total width of about 16 feet for the following 3 years and 24 feet for the next 3 years. Tree-row space is cultivated independently from the fifth to the tenth years; rest of space usually cropped in cotton, peanuts, or corn.

2/ See p.22 for definition of "Rate of work per day".

3/ Charges for land preparation and seeding of cover crop are prorated to pecan trees on the basis of the land area used by the trees. These charges to pecan trees are as follows: First 4 years, 17 percent; following 3 years, 34 percent; and next 3 years, 51 percent. Percentage charges to pecan trees for cultivation are the same as for land preparation for the first 4 years, and 100 percent from the fifth to the tenth years.

4/ Based on 2 cultivations with a weeder and 3 cultivations with a single stock.

5/ Includes orchard sanitation and replacing missing trees.

Table 17.- Georgia, Albany district: Cost per acre of developing a pecan orchard for the first 10 years, by years, according to an approved method and at cost rates prevailing in 1940

Item	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
Fertilizer around trees pounds		14	28	42	56	70	84	98	112	126
Labor and power:										
Man labor hours	24.1	8.0	7.5	9.8	5.5	6.2	6.1	7.3	7.8	7.8
Horse work do.	5.6	2.6	2.2	4.0	.6	1.3	1.3	1.4	1.7	1.5
Tractor work do.	.5	.5	.5	.5	2.0	2.0	2.0	2.8	2.8	2.8
Labor and power:	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.
Man labor 1/	2.96	.99	.93	1.22	.72	.80	.80	.97	1.03	1.03
Horse work 1/	.67	.31	.26	.48	.07	.16	.16	.17	.20	.18
Tractor work 1/	.30	.30	.30	.30	1.20	1.20	1.20	1.68	1.68	1.68
Total	3.93	1.60	1.49	2.00	1.99	2.16	2.16	2.82	2.91	2.89
Materials:										
Trees @ 75¢ each	15.00									
Fertilizer around trees @ $36 per ton		.25	.50	.76	1.00	1.26	1.51	1.76	2.02	2.27
Fertilizer for cover crop @ $15 per ton 2/ 5/	.26	.26	.26	.26	.51	.51	.51	.76	.76	.76
Cover-crop seed: 3/ 5/										
Hairy vetch @ 10¢ per pound	.34		.34		.68		.68		1.02	
Austrian winter peas @ 5¢ per pound		.26		.26		.51		.76		.76
Miscellaneous 4/	.40	.65	.35	.20	.25	.30	.26	.25	.25	.20
Total	16.00	1.42	1.45	1.48	2.44	2.58	2.96	3.53	4.05	3.99
Other costs:										
Taxes 5/	.03	.03	.03	.03	.07	.07	.07	.10	.10	.10
Use of machinery 6/	.23	.14	.13	.18	.26	.28	.28	.38	.39	.38
Overhead 6/	2.99	.45	.44	.52	.66	.71	.77	.95	1.04	1.03
Total	3.25	.62	.60	.73	.99	1.06	1.12	1.43	1.53	1.51
Total cost, exclusive of interest	23.18	3.64	3.54	4.21	5.42	5.80	6.24	7.78	8.49	8.39
Interest @ 5 percent 5/ 6/	.23	1.38	1.62	1.89	2.39	2.78	3.21	3,88	4.47	5.11
Total cost	23.41	5.02	5.16	6.10	7.81	8.58	9.45	11.66	12.96	13.50
Cost of development at end of each year 7/	43.41	48.43	53.59	59.69	67.50	76.08	85.53	97.19	110.15	123.65

1/ Ordinary labor charge at 10 cents, tractor operator at 12½ cents, supervision at 25 cents, horse work at 12 cents, and tractor work at 60 cents an hour.

2/ Based on 16 percent superphosphate applied for winter cover crop at the rate of 200 pounds an acre.

3/ Based on hairy vetch alternated with Austrian winter peas; hairy vetch seeded at the rate of 20 pounds and Austrian winter peas at the rate of 30 pounds an acre.

4/ Includes trees for replanting and other miscellaneous materials.

5/ Charges for fertilizer for winter cover crop, cover-crop seed, taxes, and interest prorated to pecan trees on the basis of the land area used by the trees. These charges to pecan trees are: First 4 years, 17 percent; following 3 years, 34 percent; and the next three years, 51 percent.

6/ See p. 22 for method of computing machinery, overhead, and interest charges.

7/ Total cost including interest plus initial value of land, at $20 an acre.

Table 18.- Georgia, Albany district: Annual labor and power cost per acre of operating pecan orchards 15 to 19 years old 1/ with a yield of 85 pounds per acre according to a common method and at cost rates prevailing in 1940 2/

Operation	Labor and power			Rate of work per day	Times done	Man labor	Horse work	Tractor work	Cost
	Man	Horse	Tractor						
	Number	Number	Number	Orchard acres	Number	Hours	Hours	Hours	Dollars
Plow	1		1	7.5	1	1.3		1.3	.94
Cultivate (disk harrow)	1		1	16.0	3	1.9		1.9	1.38
Drill cover-crop seed	1		1	15.0	1	.7		.7	.51
Harvest: 3/									
Thresh and pick				4/		17.0			5/1.28
Haul to storage, dry and sack						1.5	1.3		6/ .31
Haul to market (8 miles)						.1			7/ .06
Supervision						4.6			1.15
Miscellaneous 8/						3.3	1.6	.2	.65
Total						30.4	2.9	4.1	6.28

1/ Trees set 46 2/3 by 46 2/3 feet, or 20 to the acre. There is now about 85 percent of a full stand. The orchard practice as outlined should produce a higher yield after it has been in operation a longer period of time and after the excess trees have been removed and more attention has been given to disease and insect control.

2/ Ordinary labor charged at 10 cents, tractor operator at 12½ cents, supervision at 25 cents, horse work at 12 cents, and tractor work at 60 cents an hour.

3/ Based on pecans sold to local or other wholesale buyers and delivered to local shipping point.

4/ Pecan trees are usually threshed one time, and the orchard is gone over about three times in picking up nuts. Threshing is at the rate of 20 trees per man per day, and picking at an average rate of 100 pounds per man per day.

5/ Based on a contract rate of 1½ cents per pound for threshing trees and picking up nuts.

6/ Based on 1.75 man hours and 1.5 horse hours per 100 pounds of pecans produced.

7/ Based on use of motor truck at 10 cents per mile, and 1 man hauling 3,000 pounds of pecans per load or 9,000 pounds per day.

8/ Includes 0.9 man hours for pruning, 1.6 man and 1.7 horse hours for applying fertilizer, and 0.7 man hours and 0.2 tractor hours for spraying and orchard sanitation.

Table 19.- Georgia, Albany district: Annual cost of operating pecan orchards 15 to 19 years old 1/ according to a common method and at cost rates prevailing in 1940

Item	Quantity per acre	Cost per acre
	Pounds	Dollars
Yield per acre	85	
Labor and power:		
Preharvest	Hours	
Man labor	8.5	1.15
Horse work	1.6	.19
Tractor work	4.1	2.46
Total		3.80
Harvest 2/		
Man labor	21.9	2.27
Horse work	1.3	.16
Truck work		.05
Total		2.48
Materials:	Pounds	
Winter cover crop, Austrian winter peas @ 5 cents per pound	30	1.50
	Number	
Sacks	.85	.08
Miscellaneous 3/		2.05
Total		3.63
Other costs:		
Taxes		.20
Use of machinery, not including tractor or truck 4/		.72
Overhead 4/		1.49
Total		2.41
Total cost, exclusive of interest		12.32
Interest at 5 percent 4/		6.36
Total cost		18.68
		Cost per pound
Cost per pound, exclusive of interest		.145
Cost per pound, inclusive of interest		.220
Quantity of nuts at 12.2 cents per pound 5/ required to cover cost per acre	Pounds	
Exclusive of interest	101	
Inclusive of interest	153	

1/ Trees set 46 2/3 by 46 2/3 feet, or 20 to the acre. There is now about 85 percent of a full stand. The orchard practice as outlined in table 18, should produce a higher yield after it has been in operation a longer period of time and after the excess trees have been removed and more attention has been given to disease and insect control.

2/ Based on pecans sold to local or other wholesale buyers and delivered to local shipping point.

3/ Includes $1.93 for commercial fertilizer, and $0.12 for spray material.

4/ See p. 22 for method of computing machinery, overhead, and interest charges.

5/ The 1940 State average farm price.

Orchard management is an especially important factor in the Albany district because of the large holdings under the management of individuals. The test of successful orchard management is measured by the ability to realize yields commensurate with the outlay of capital and labor and the use of the land. Some of the orchards had profitable yields, but most of them did not. A mistaken impression of the length of time required for a young orchard to come into commercial bearing often means inadequate provision at the outset for financing the enterprise, with a consequent neglect of the orchard during some part of the development period. In some cases it has been difficult to overcome this imposed handicap, except at the expense of a delayed bearing period or even partial replanting of portions of the orchard. This is the history of many of the larger plantings represented by absentee ownership in which the owner, usually living at a distance, did not make adequate provision for financing the enterprise during the development stage. Individual holdings of absentee owners (usually 5-acre tracts) were so small that the owner did not receive any appreciable return from intertilled crops during the development.

Another imposed hardship at the outset was the fact that many orchards were planted too closely for the future well-being of the trees. The common practice of planting pecan trees 46-2/3 by 46-2/3 feet, or 20 to the acre, has been a decided factor in the poor development of many pecan orchards in this district. Of 44 blocks of pecan trees 15 years old and older, 75 percent were set at the rate of 20 or more trees an acre. In 1941, 40 percent of these same blocks of trees still had 16 or more trees an acre. The larger size, better quality, and higher yields of pecans produced at a reduced cost per acre and per pound in an orchard in the Albany district compared with the results obtained where trees are planted too closely are discussed in some detail on pages 7 and 8.

Records obtained on 29 orchards through personal visits showed that only 3 percent of the trees in these orchards were sprayed. Of the trees sprayed about 75 percent were Schley. In an area containing such a large proportion of the trees subject to disease infection, spraying is essential if satisfactory yields are to be attained (see p.13). The turning under of leguminous cover crops and the use of commercial fertilizer around the trees and with the cover crop have been practiced profitably in several of the more successful established orchards and should be a part of the orchard-management program of more growers in the district.

Florida

Monticello District

Orchards studied in the Monticello district of Florida are all in Jefferson County. The orchard-development program for this district provides for corn interplanted in the orchard for 2 successive years and alternated with peanuts or some other cultivated crop for harvest the third year. These interplanted crops are grown up to but not including the tree row for the first 4 years. Beginning with the fifth year a free space is allowed on each side of the tree row. These tree-row spaces have a total width of approximately 16 feet for the following 3 years and 24 feet for the next 3 years and are cultivated independently of interplanted crops.

In the spring the orchard acreage is plowed and planted to field crops. After an application of fertilizer around the trees, the interplanted crops are cultivated with one-horse cultivators, the trees receiving the same cultivation as that given the interplanted crops. For the remainder of the development period the free space on each side of the tree row is cultivated independently with tractor-drawn disk harrows. In the fall following the preparation of the soil with a disk harrow a winter cover crop of hairy vetch alternated with Austrian winter peas is planted.

During the first 10 years of growth a total of about 101 man hours, 69 horse hours, and 12 tractor hours are used to plant, fertilize around the trees, cultivate, seed the cover crop, prune, and care for the trees. At rates prevailing in 1940, the labor and power costs amounted to about $28 an acre (table 20). In 1940 pecan-orchard land was valued at $20 an acre. The cost of trees, labor and power, fertilizer, cover-crop seed, taxes, interest, and other items chargeable to the trees, plus the value of the land on which the trees were set, amounted to about $39 an acre for the first year. At the end of 10 years, the total cost including interest on the investment compounded annually, and $20 for land amounted to $132.87 an acre (table 21).

Growing interplanted crops for harvest in the orchard is not common after young orchards come into commercial bearing. The management of bearing orchards in this district varies from pasturing livestock in the orchard and leaving the orchard uncultivated for the most part to giving them reasonably good care. A winter cover crop of oats for pasture was grown in some orchards. By far the most common cover-crop practice, however, was to grow a winter cover crop of Augusta vetch, followed by a summer cover of crotalaria, both of which were allowed to mature and reseed. With this system, 2 cultivations with a disk harrow, and a yield of 110 pounds of nuts an acre, the equivalent of about 3 days of man labor, about one-fourth day of horse work, and one-fifth day of tractor work were used an acre (table 22). The labor, power, and other costs are shown in table 23. The total cost excluding interest was about $7.50 an acre and 7 cents per pound; including interest it was about $14.50 an acre and 13 cents per pound.

On the basis of the State average farm price of 11.2 cents per pound in 1940, the 5-year average yield for the district was 42 pounds in excess of the quantity necessary to cover the costs an acre excluding interest, but it was 19 pounds less than the quantity necessary to cover the costs an acre including interest.

The range in yields of orchards of bearing age (10 years old and older) in the district shows that many orchards did not have a yield sufficiently high to cover costs. Of the group of bearing orchards from which production records were obtained, 39 percent did not have yields sufficient to cover costs excluding interest charges; and 61 percent did not have yields sufficient to cover costs including interest charges.

Conditions affecting yields in the Monticello district of Florida are in many respects like those in the Albany district of Georgia except that the problem of absentee ownership is not serious. Several factors in the Monticello district may operate, singly or in combination, in bringing about low yields. Most of the orchards are located on sandy soils. Trees have often been planted where it is difficult to secure worth-while yields because soil and topography are not suitable. The common practice of setting trees 50 by 50 feet, or 17 to the acre, and the failure to remove excess trees in later years has brought severe crowding of trees in many orchards. Of 28 blocks of trees, 15 years old

Table 20. - Florida, Monticello district: Labor and power cost per acre of developing a pecan orchard during the first 10 years, according to an approved method 1/ and at cost rates prevailing in 1940

Operation	Years operation is performed	Labor and power			Rate of work per day 2/	Times done each year	Percentage charged to pecans	Charged to pecans			Cost
		Man	Horse	Tractor				Man labor	Horse work	Tractor work	
		Number	Number	Number	Orchard acres	Number	Percent	Hours	Hours	Hours	Dollars
Plow	1st-10th inc.	1	2		1.5	1	3/16-48	20.3	40.6		6.50
Harrow (disk)	do.	1		1	16	1	3/16-48	1.9		1.9	1.47
Plant:											
Set stakes	First	3			30	1	100	1.0			.10
Dig holes	do.	2			7	1	100	2.9			.29
Set trees	do.	5	2		14	1	100	3.6	1.4		.52
Apply fertilizer around trees	2nd-4th inc.	2	2		30	1	100	2.1	2.1		.44
	5th & 6th	2	2		25	1	100	1.6	1.6		.34
	7th & 8th	2	2		20	1	100	2.0	2.0		.42
	9th & 10th	2	2		16	1	100	2.4	2.4		.50
Cultivate	1st, 2nd & 4th	1	1		3.5	3	3/16	4.2	4.2		.88
	Third	1	1		15	4/ 2	3/16	.2	.2		.04
	do.	1	1		3	4/ 3	3/16	1.6	1.6		.34
Cultivate tree rows (disk harrow)	5th-7th inc.	1		1	35	3	100	2.7		2.7	2.09
	8th-10th inc.	1		1	25	3	100	3.6		3.6	2.79
Hoe around trees	1st-4th inc.	1			12	2	100	6.8			.68
Harrow (disk-fall)	1st-10th inc.	1		1	16	1	3/16-48	1.9		1.9	1.47
Apply fertilizer for cover crop	do.	2	2		10	1	3/16-48	6.0	6.0		1.26
Seed cover crop	do.	1			20	1	3/16-48	1.6			.16
Disk in cover crop seed	do.	1		1	16	1	3/16-48	1.9		1.9	1.47
Prune	2nd-10th inc.						100	4.9			.49
Remove pruned wood	5th-10th inc.						100	2.1	4.2		.67
Supervision	1st-10th inc.						100	15.2			3.80
Miscellaneous 5/	do.						100	11.0	2.6		1.39
Total								101.5	68.9	12.0	28.11

1/ Based on trees set 50 by 50 feet or 17 to the acre and on corn interplanted for 2 successive years and alternated with peanuts for harvest the third year; interplanted up to but not including the tree row for the first 4 years. Tree-row spaces have a total width of about 16 feet for the following 3 years and 24 feet for the next 3 years. Tree-row space is cultivated independently from the fifth to the tenth years; rest of the space usually is cropped in corn, peanuts or some other intertilled crop for harvest.

2/ See p.22 for definition of "Rate of work per day."

3/ Charges for land preparation and seeding of cover crop prorated to pecan trees on the basis of the land area used by the trees. These charges to pecan trees are: First 4 years, 16 percent; following 3 years, 32 percent; and next 3 years, 48 percent. Percentage charges to pecan trees for cultivation are the same as for land preparation for the first 4 years and 100 percent from the fifth to the tenth years.

4/ Based on 2 cultivations with a weeder and 3 cultivations with a single stock.

5/ Includes orchard sanitation and replacing missing trees.

Table 21.- Florida, Monticello district: Cost per acre of developing a pecan orchard for the first 10 years, by years, according to an approved method and at cost rates prevailing in 1940

Item		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
Fertilizer around trees	pounds		12	24	36	48	60	72	84	96	10
Labor and power:											
Man labor	hours	14.8	9.8	9.8	9.4	8.1	8.5	8.6	10.9	10.9	10.7
Horse work	do.	5.4	5.0	5.4	5.1	6.3	6.5	6.8	9.4	9.5	9.5
Tractor work	do.	.3	.3	.3	.3	1.5	1.5	1.5	2.1	2.1	2.1
Labor and power:		Dols	Dols	Dols	Dols	Dols	Dols	Dols	Dols	Dols	Dols
Man labor 1/		1.82	1.22	1.22	1.16	1.03	1.08	1.09	1.38	1.39	1.36
Horse work 1/		.59	.55	.59	.56	.69	.72	.75	1.03	1.04	1.04
Tractor work 1/		.20	.20	.20	.20	.98	.98	.98	1.36	1.36	1.36
Total		2.61	1.97	2.01	1.92	2.70	2.78	2.82	3.77	3.78	3.76
Materials:											
Trees @ 75¢ each		12.75									
Fertilizer around trees @ $36 per ton			.22	.43	.65	.86	1.08	1.30	1.51	1.73	1.94
Fertilizer for cover crop @ $15 per ton 2/ 5/		.36	.36	.36	.36	.72	.72	.72	1.08	1.08	1.08
Cover crop seed: 3/											
Hairy vetch @ 10¢ per pound		.32		.32		.64		.64		.96	
Austrian winter peas @ 5¢ per pound			.24		.24		.48		.72		.72
Miscellaneous 4/		.17	1.81	1.55	1.43	.71	.69	.55	.41	.28	.14
Total		13.60	2.63	2.66	2.63	2.93	2.97	3.21	3.72	4.05	3.88
Other costs:											
Taxes 5/		.03	.03	.03	.03	.05	.05	.05	.08	.08	.08
Use of machinery 6/		.20	.19	.20	.19	.37	.38	.38	.53	.54	.54
Overhead 6/		2.43	.69	.70	.69	.84	.86	.90	1.12	1.17	1.15
Total		2.66	.91	.93	.91	1.26	1.29	1.33	1.73	1.79	1.77
Total cost, exclusive of interest		18.87	5.51	5.60	5.51	6.89	7.04	7.36	9.22	9.62	9.41
Interest @ 5 percent 5/ 6/		.21	1.16	1.50	1.85	2.42	2.89	3.39	4.12	4.79	5.51
Total cost		19.08	6.67	7.10	7.36	9.31	9.93	10.75	13.34	14.41	14.92
Cost of development at end of each year 7/		39.08	45.75	52.85	60.21	69.52	79.45	90.20	103.54	117.95	132.87

1/ Ordinary labor charged at 10 cents, tractor operator at $12\frac{1}{2}$ cents, supervision at 25 cents, horse work at 11 cents, and tractor work at 65 cents an hour.

2/ Based on 16 percent superphosphate applied for cover crop at the rate of 300 pounds an acre.

3/ Based on hairy vetch alternated with Austrian winter peas; hairy vetch seeded at the rate of 20 pounds and Austrian winter peas at the rate of 30 pounds an acre.

4/ Includes trees for replanting and other miscellaneous materials.

5/ Charges for fertilizer for cover-crop, cover-crop seed, taxes, and interest prorated to pecan trees on the basis of the land area used by the trees. These charges to pecan trees are: First 4 years, 16 percent; following 3 years, 32 percent; and the next 3 years, 48 percent.

6/ See p. 22 for method of computing machinery, overhead, and interest charges.

7/ Total cost including interest plus initial value of land, at $20 an acre.

Table 22.- Florida, Monticello district: Annual labor and power cost per acre of operating pecan orchards 15 to 19 years old 1/ with a yield of 110 pounds per acre according to a common method and at cost rates prevailing in 1940 2/

Operation	Labor and power			Rate of work per day	Times done	Man labor	Horse work	Tractor work	Cost
	Man	Horse	Tractor						
	Number	Number	Number	Orchard acres	Number	Hours	Hours	Hours	Dollars
Cultivate (disk harrow)	1		1	16	2	1.2		1.2	.93
Harvest: 3/									
Thresh and pick				4/		17.8			5/1.65
Haul to storage, dry and sack						1.9	1.6		6/ .37
Haul to market (5 miles)						.1			7/ .04
Supervision						4.2			1.05
Miscellaneous 8/						2.7	1.0	.3	.59
Total						27.9	2.6	1.5	4.63

1/ Trees set 50 by 50 feet or 17 to the acre. There is now about 80 percent of a full stand.

2/ Ordinary labor charged at 10 cents, tractor operator at 12½ cents, supervision at 25 cents, horse work at 11 cents, and tractor work at 65 cents an hour.

3/ Based on pecans sold to local or other wholesale buyers and delivered to local shipping point.

4/ Pecan trees are usually threshed 1 time, and the orchard is gone over about 3 times in picking up nuts. Threshing is at the rate of 20 trees per man per day, and picking at an average rate of 100 pounds per man per day.

5/ Based on a contract rate of 1½ cents per pound for threshing trees and picking up nuts.

6/ Based on 1.75 man hours and 1.5 horse hours per 100 pounds of pecans produced.

7/ Based on use of motortruck at 10 cents per mile, and 1 man hauling 3,000 pounds of pecans per load or 9,000 pounds per day.

8/ Includes 1.8 man hours and 1.0 horse hour for applying fertilizer and seeding cover crop, 0.3 man hours and 0.3 tractor hours for spraying, and 0.6 man hours for pruning and orchard sanitation.

Table 23.- Florida, Monticello district: Annual cost of operating pecan orchards 15 to 19 years old 1/ according to a common method and at cost rates prevailing in 1940

Item	Quantity per acre	Cost per acre
	Pounds	Dollars
Yield per acre	110	
Labor and power:		
Preharvest	Hours	
Man labor	4.6	0.61
Horse work	1.0	.11
Tractor work	1.5	.98
Total		1.70
Harvest 2/		
Man labor	23.3	2.72
Horse work	1.6	.18
Truck work		.03
Total		2.93
	Number	
Materials:		
Sacks	1.1	.05
Miscellaneous 3/		1.45
Total		1.50
Other costs:		
Taxes		.16
Use of machinery, not including tractor or truck 4/		.46
Overhead 4/		.92
Total		1.54
Total cost, exclusive of interest		7.67
Interest at 5 percent 4/		6,76
Total cost		14.43.
		Cost per pound
Cost per pound, exclusive of interest		.07
Cost per pound, inclusive of interest		.131
Quantity of nuts at 11.2 cents per pound 5/ required to cover cost per acre	Pounds	
Exclusive of interest	68	
Inclusive of interest	129	

1/ Trees set 50 by 50 feet or 17 to the acre. There is now about 30 percent of a full stand.

2/ Based on pecans sold to local or other wholesale buyers and delivered to local shipping point.

3/ Includes $0.95 for commercial fertilizer, $0.25 for spray material, and $0.25 for cover-crop seed.

4/ See p. 22 for method computing machinery, overhead, and interest charges.

5/ The 1940 State farm price.

and older, 75 percent were set at the rate of 17 or more trees an acre. Of these same blocks of trees, 68 percent had 14 or more trees an acre in 1941. Too little attention has been given to suitable cover crops, and the use of fertilizers has been too limited. The nut case-bearer is a serious insect pest here and very little is being done by growers to control it. Records obtained through personal visits indicate that only two orchards were sprayed.

Individual orchards of well-chosen varieties have proved successful when leguminous cover crops have been used, supplemented by commercial fertilizers and proper cultural practices and when diseases and insect pests have been controlled. The general system of orchard management followed with the yields secured on an orchard located on sandy loam and largely composed of Stuart and Moore varieties is outlined briefly as a system of orchard management followed in the district that has resulted in a relatively good yield. The orchard has had an annual summer cover crop of crotolaria and a winter cover crop of Augusta vetch. In the spring between March 15 and April 15 the winter vetch is disked in green with a 7-foot double-disk tractor harrow. Crotolaria is then seeded. In the fall the crotolaria is disked in green and Augusta vetch seeded. A complete fertilizer of a 4-8-5 analysis was used annually either around the trees or with the winter cover crop. Fertilizer applications around the trees have been at the rate of about 25 pounds per tree and with the cover-crop seeding at about 500 pounds an acre. During the 5-year period 1936 to 1940 inclusive, the orchard produced an average annual yield of 375 pounds of nuts an acre. This orchard was originally planted at distances of 50 by 50 feet or 17 trees an acre but had been thinned to a stand of 15 trees an acre. The trees actually in bearing, therefore, produced an annual average of 25 pounds of nuts per tree during the 5-year period.

Eastern District

The orchards studied in the eastern district of Florida are in Alachua, Bradford, and Duval Counties, the majority being in the first two counties. The orchard development program in this district provides for corn interplanted in the orchard for 2 successive years and alternated with vegetables or some other crop for harvest the third year. Crotolaria is seeded at the time of the last cultivation of corn in years when corn follows corn. These interplanted crops are grown up to but not including the tree row for the first 4 years. Beginning with the fifth year a free space is allowed on each side of the tree row. These tree-row spaces have a total width of approximately 16 feet for the following 3 years and 24 feet for the next 3 years and are cultivated independently of the interplanted crop.

In the spring the orchard acreage is plowed and planted to field crops. Following an application of fertilizer around the trees, the interplanted crops and trees are cultivated with one-horse cultivators. After the fourth year the free tree-row space is cultivated with tractor-drawn disk harrows.

During the first 10 years of growth, a total of about 98 man hours, 58 horse hours, and 8 tractor hours are used to plant, fertilize, cultivate, prune, and care for the trees. At rates prevailing in 1940, the labor and power costs for the first 10 years amounted to about $24 an acre (table 24).

Table 24. - Florida, eastern district: Labor and power cost per acre of developing a pecan orchard during the first 10 years according to an approved method 1/ and at cost rates prevailing in 1940

Operation	Years operation is performed	Labor and power			Rate of work per day 2/	Times done each year	Percentage charged to pecans	Charged to pecans			Cost
		Man	Horse	Tractor				Man labor	Horse work	Tractor work	
		Number	Number	Number	Orchard acres	Number	Percent	Hours	Hours	Hours	Dollars
Plow	1st-10th inc.	1	2		2	1	3/16-48	15.2	30.4		4.86
Harrow (disk)	do.	1		1	16	1	3/16-48	1.9		1.9	1.57
Plant:											
Set stakes	First	2			20	1	100	1.0			.10
Dig holes	do.	1			2	1	100	5.0			.50
Set trees	do.	5	2		10	1	100	5.0	2.0		.72
Apply fertilizer around trees	Second	2	2		25	1	100	.8	.8		.17
	Third	2	2		22	1	100	.9	.9		.19
	Fourth	2	2		20	1	100	1.0	1.0		.21
	Fifth	2	2		18	1	100	1.1	1.1		.23
	Sixth	2	2		16	1	100	1.2	1.2		.25
	Seventh	2	2		14	1	100	1.4	1.4		.29
	Eighth	2	2		12	1	100	1.7	1.7		.36
	Ninth	2	2		11	1	100	1.8	1.8		.38
	Tenth	2	2		10	1	100	2.0	2.0		.42
Cultivate	1st-4th inc.	1	1		3.5	3	3/16	5.6	5.6		1.18
Cultivate tree rows (disk harrow)	5th-7th inc.	1		1	35	3	100	2.7		2.7	2.23
	8th-10th inc.	1		1	25	3	100	3.6		3.6	2.97
Hoe around trees	1st-4th inc.	1			12	2	100	6.8			.68
Apply fertilizer for cover crop	1st and 4th	2	2		10	1	3/16	.6	.6		.12
	Seventh	2	2		10	1	3/32	.6	.6		.12
	Tenth	2	2		10	1	3/48	1.0	1.0		.21
Seed crotolaria	1st and 4th	1			20	1	3/16	.2			.02
	Seventh	1			20	1	3/32	.2			.02
	Tenth	1			20	1	3/48	.2			.02
Prune	2nd-10th inc.						100	5.8			.58
Remove pruned wood	6th-10th inc.						100	3.2	3.2		.67
Supervision	1st-10th inc.						100	14.6			3.65
Miscellaneous 4/	do.						100	12.4	2.9		1.56
Total								97.5	58.2	8.2	24.28

1/ Based on trees set 50 by 50 feet or 17 to the acre and on corn interplanted for 2 successive years and alternated with vegetables or some other crop for harvest the third year. Crotolaria seeded at the time of the last cultivation of corn in years when corn follows corn. Interplanted crops grown up to but not including the tree row for the first 4 years. Tree-row spaces have a total width of about 16 feet for the following 3 years and 24 feet for the next 3 years. Tree-row space is cultivated independently from the fifth to the tenth years.

2/ See p.22 for definition of "Rate of work per day."

3/ Charges for land preparation and seeding of cover crop prorated to pecan trees on the basis of the land area used by the trees. These charges to pecan trees are: First 4 years, 16 percent; following 3 years, 32 percent; and next 3 years, 48 percent. Percentage charges to pecan trees for cultivation are the same as for land preparation for the first 4 years and 100 percent from the fifth to the tenth year.

4/ Includes orchard sanitation and replacing missing trees.

In 1940, pecan-orchard land was valued at about $30 an acre. Trees for planting 50 feet each way cost $12.75 (17 trees at 75 cents each). The cost of trees, labor and power, fertilizer, cover-crop seed, and other items chargeable to the trees, plus the value of the land on which the trees were set, amounted to about $50 an acre for the first year. At the end of 10 years the total cost, including interest on the investment compounded annually and $30 for land amounted to $132.96 an acre (table 25).

Many bearing orchards in this district are receiving only the minimum of attention. Crops for harvest are not usually grown in bearing orchards and winter cover crops are not common, but a volunteer crop of crotolaria was found in about one-half of the orchards surveyed. Many orchardists turn under this growth with one- or two-horse turning plows but this work was more commonly done with tractor-drawn disk harrows. Pecan orchards in this district are relatively small and only 33 percent of the men interviewed had tractors and tractor-drawn equipment. Orchardists without tractor-drawn equipment commonly had their orchard cultivation done on a contract basis.

Under a system of orchard management with a volunteer crop of crotolaria, three cultivations with tractor-drawn disk harrows and a yield of 130 pounds of pecans an acre, about 3 days of man-labor, and about one-fourth day each of horse work and tractor work were used in the care and harvest of an acre of nuts (table 26).

The total cost of producing an acre of pecans excluding interest, amounted to approximately $9 an acre and 7 cents per pound; including interest at 5 percent it was about $16 an acre and 12 cents per pound (table 27). The 5-year average yield of 130 pounds an acre for the district was 48 pounds an acre in excess of the quantity necessary to cover the cost excluding interest, but it was 12 pounds an acre less than the quantity necessary to cover the cost an acre including interest. Production records for the district for 25 bearing orchards showed a 5-year average yield that ranged from less than 2 pounds to 111 pounds per tree. Sixty-one percent of these orchards had yields sufficient to cover costs excluding interest charges; but only 39 percent had yields sufficient to cover costs including interest charges.

An especially important factor in this district is the selection of a site for the orchard with respect to suitable soil. A majority of the soils on which pecan trees are planted is a fine sandy loam with an impervious subsoil layer that does not permit proper drainage. These soils have a high water table and a winter cover crop cannot be successfully grown. Another imposed handicap is close planting of trees. The common practice of setting pecan trees 50 by 50 feet, or 17 to the acre, and the failure to remove excess trees in later years has resulted in severe crowding of trees in many orchards. Of 38 blocks of trees 15 years old and over, 76 percent was originally set at the rate of 17 or more an acre. In 1941, 58 percent of the same blocks of trees had 15 or more trees an acre.

Orchard sanitation work averaged about 2 hours an acre and consisted mainly of removing Spanish moss from the trees and an attempt to control web worms and caterpillars by hand methods.

Table 25.- Florida, eastern district: Cost per acre of developing a pecan orchard for the first 10 years, by years, according to an approved method and at cost rates prevailing in 1940

Item	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
Fertilizer around trees pounds		34	68	102	136	170	204	238	272	306
Labor and power:										
Man labor hours	19.5	8.9	8.6	8.0	7.3	7.2	8.5	9.3	9.0	11.2
Horse work do.	5.6	4.3	4.4	4.5	4.7	5.3	6.0	7.3	7.4	8.7
Tractor work do.	.1	.1	.1	.1	1.1	1.1	1.1	1.5	1.5	1.5
Labor and power:	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols	Dols.	Dols.
Man labor 1/	2.39	1.09	1.06	.98	.92	.91	1.07	1.18	1.13	1.41
Horse work 1/	.62	.47	.48	.50	.52	.58	.66	.80	.81	.96
Tractor work 1/	.07	.07	.07	.07	.77	.77	.77	1.05	1.05	1.05
Total	3.08	1.63	1.61	1.55	2.21	2.26	2.50	3.03	2.99	3.42
Materials:										
Trees @ 75¢ each	12.75									
Fertilizer around trees @ $25 per ton		.42	.85	1.28	1.70	2.12	2.55	2.98	3.40	3.82
Fertilizer for cover crop @ $15 per ton 2/ 5/	.36			.36			.72			1.08
Cover-crop seed (crotolaria) @ 10¢ per pound 3/ 5/	.32			.32			.64			.96
Miscellaneous 4/	.30	.85	.65	.05	.15	.08	.06	.12	.10	.08
Total	13.73	1.27	1.50	2.01	1.85	2.20	3.97	3.10	3.50	5.94
Other costs:										
Taxes 5/	.04	.04	.04	.04	.08	.08	.08	.12	.12	.12
Use of machinery 6/	.18	.14	.14	.15	.27	.29	.31	.40	.40	.44
Overhead 6/	2.52	.44	.47	.53	.61	.67	.97	.92	.97	1.40
Total	2.74	.62	.65	.72	.96	1.04	1.36	1.44	1.49	1.96
Total cost, exclusive of interest	19.55	3.52	3.76	4.28	5.02	5.50	7.83	7.57	7.98	11.32
Interest at 5 percent 5/ 6/	.28	1.27	1.51	1.77	2.34	2.72	3.13	3.94	4.52	5.15
Total cost	19.83	4.79	5.27	6.05	7.36	8.22	10.96	11.51	12.50	16.47
Cost of development at end of each year 7/	49.83	54.62	59.89	65.94	73.30	81.52	92.48	103.99	116.49	132.96

1/ Ordinary labor charged at 10 cents, tractor operator at 12½ cents, supervision at 25 cents, horse work at 11 cents, and tractor work at 70 cents an hour.

2/ Based on 16 percent superphosphate applied for cover crop at the rate of 300 pounds an acre.

3/ Based on crotolaria seeded at the last cultivation of corn in the first, fourth, seventh, and tenth years at the rate of 20 pounds an acre.

4/ Includes trees for replanting and other miscellaneous materials.

5/ Charges for fertilizer for cover-crop, cover crop seed, taxes, and interest prorated to pecan trees on the basis of the land area used by the trees. The charges to pecan trees are: First 4 years, 16 percent; the following 3 years, 32 percent; and the next 3 years, 48 percent.

6/ See p. 22 for method of computing machinery, overhead, and interest charges.

7/ Total cost including interest plus initial value of land, at $30 an acre.

Table 26.- Florida, eastern district: Annual labor and power cost per acre of operating pecan orchards 15 to 19 years old 1/ with a yield of 130 pounds per acre according to a common method and at cost rates prevailing in 1940 2/

Operation	Labor and power			Rate of work per day	Times done	Man labor	Horse work	Tractor work	Cost
	Man	Horse	Tractor						
	Number	Number	Number	Orchard acres	Number	Hours	Hours	Hours	Dollars
Cultivate (disk harrow)	1		1	16	3	1.9		1.9	1.57
Harvest: 3/									
Thresh and pick				4/		20.2			5/1.95
Haul to storage, dry and sack				6/		2.3	2.0		.45
Supervision						4.9			1.22
Miscellaneous 7/						3.4	.5		.40
Total						32.7	2.5	1.9	5.59

1/ Trees set 50 by 50 feet or 17 to the acre. There is now about 85 percent of a full stand.

2/ Ordinary labor charged at 10 cents, tractor operator at 12½ cents, supervision at 25 cents, horse work at 11 cents, and tractor work at 70 cents an hour.

3/ Based on pecans sold at the farm to local or other wholesale buyers.

4/ Pecan trees are usually threshed 1 time and the orchard is gone over about 3 times in picking up nuts. Threshing is at the rate of 20 trees per man per day, and picking at an average rate of 100 pounds per man per day.

5/ Based on a contract rate of 1½ cents per pound for threshing trees and picking up nuts.

6/ Based on 1.75 man hours and 1.5 horse hours per 100 pounds of pecans produced.

7/ Includes 2.0 man hours for orchard sanitation, 0.5 man hours for pruning and 0.9 man hours and 0.5 horse hours for applying fertilizer and seeding cover crop.

Table 27.- Florida, eastern district: Annual cost of operating pecan orchards 15 to 19 years old 1/ according to a common method and at cost rates prevailing in 1940

Item	Quantity per acre	Cost per acre
	Pounds	Dollars
Yield per acre	130	
Labor and power:		
Preharvest	Hours	
Man labor	6.2	0.30
Horse work	.5	.06
Tractor work	1.9	1.33
Total		2.19
Harvest 2/		
Man labor	26.5	3.18
Horse work	2.0	.22
Total		3.40
Materials:	Number	
Sacks	1.3	.06
Miscellaneous 3/		1.90
Total		1.96
Other costs:		
Taxes		.25
Use of machinery, not including tractor 4/		.30
Overhead 4/		1.13
Total		1.68
Total cost, exclusive of interest		9.23
Interest at 5 percent 4/		6.73
Total cost		15.96
		Cost per pound
Cost per pound, exclusive of interest		.071
Cost per pound, inclusive of interest		.123
Quantity of nuts at 11.2 cents per pound 5/ required to cover cost per acre	Pounds	
Exclusive of interest	82	
Inclusive of interest	142	

1/ Trees set 50 by 50 feet or 17 to the acre. There is now about 35 percent of a full stand.

2/ Based on pecans sold at the farm to local or other wholesale buyers.

3/ Includes $1.60 for commercial fertilizer, and $0.30 for cover-crop seed.

4/ See p. 22 for method of computing machinery, overhead, and interest charges.

5/ The 1940 State average farm price.

Spanish moss growing on pecan trees is an indication of such humid conditions and in many cases of poorly drained soils as to be limiting factors in pecan production. The high rainfall and high humidity favor the accumulation of Spanish moss and the spread of scab and foliage diseases that cause the loss of nuts or premature defoliation. Despite the prevalence of disease and insect pests especially the nut case-bearer which is worse in this district than in most eastern districts no spraying was done in the orchards studied. In orchards that are poorly situated with respect to soil fertility and soil drainage, containing a preponderance of varieties unsuited to the area, such as Schley, Success, Moneymaker and others susceptible to scab infestation, there is apparently small prospect of ever obtaining profitable yields.

In other orchards that contain more desirable varieties, such as Curtis, Moore, and Stuart, and having favorable orchard sites, much can be done to improve pecan yields. In these orchards the principal factors needing attention are the thinning of the trees to a proper stand and the adoption of an orchard-management program that takes into consideration proper cultural practices supplemented by the use of commercial fertilizer and adequate disease and insect-pest control.

Alabama

Eufaula District

Orchards studied in the Eufaula district of Alabama are all in Barbour County. The orchard-development method for this district as outlined in this report is based on interplanted crops for harvest grown in the orchard during the entire development period. Field crops include cotton, corn, peanuts, and a winter cover. Tillage and interplanting systems are like those of the Georgia districts.

During the first 10 years of growth a total of about 86 hours of man labor, 58 hours of horse work, and 10 hours of tractor work are used to plant, fertilize, cultivate, prune, seed the cover crop, and care for the trees. The cost of labor and power amounted to about $24 an acre (table 28). The total cost for the first 10 years, exclusive of the cost or value of land, amounted to $31.28 an acre (table 29).

In bearing orchards the management varies from pasturing with livestock to growing interplanted crops for harvest either with or without a winter cover crop. Field crops for harvest, usually cotton, corn, or peanuts, are commonly grown in orchards 15 to 19 years old. Winter cover crops, usually Austrian winter peas or hairy vetch may or may not be used in connection with the interplanted crop for harvest. They were more common after corn and peanuts than after cotton because early planting of cotton helps to avoid the worst boll-weevil infestations. When corn was interplanted it was not uncommon to use velvet beans with the corn. A few growers leave tree-row spaces which are cultivated independently of the intercrops but the most common method is to interplant crops up to the trees in orchards 15 to 19 years of age. The trees receive the same cultivation that is given the interplanted crops. Bearing trees, however, require more space and therefore shade out more of the intercrop than do young trees. Little or no production is expected from intercrops near the trees, although the entire space up to the trees is cultivated in the same way. The total labor and power costs chargeable to pecans for orchards handled in this way and with a yield of 85 pounds an acre, is shown in table 30, and the total 1940 cost chargeable to pecans, in table 31.

Table 28. - Alabama, Eufaula district: Labor and power cost per acre of developing a pecan orchard during the first 10 years, according to an approved method 1/ and at cost rates prevailing in 1940

Operation	Years operation is performed	Labor and power			Rate of work per day 2/	Times done each year	Percentage charged to pecans	Charged to pecans			Cost
		Man	Horse	Tractor				Man labor	Horse work	Tractor work	
		Number	Number	Number	Orchard acres	Number	Percent	Hours	Hours	Hours	Dollars
Plow	1st-10th inc.	1	2		1.5	1	3/13-40	17.1	34.2		5.47
Harrow (disk)	do.	1		1	16	1	3/13-40	1.6		1.6	1.24
Plant:											
Set stakes	First	3			25	1	100	1.2			.12
Dig holes	do.	1			3	1	100	3.3			.33
Set trees	do.	3	2		10	1	100	3.0	2.0		.52
Apply fertilizer around trees	2nd-4th inc.	3	2		45	1	100	2.1	1.2		.34
	5th & 6th	3	2		40	1	100	1.6	1.0		.27
	7th & 8th	3	2		35	1	100	1.8	1.2		.31
	9th & 10th	3	2		30	1	100	2.0	1.4		.36
Cultivate	1st & 4th	1	1		3	6	3/13	5.2	5.2		1.09
	Second	1	1		15	4/ 2	3/13	.2	.2		.04
	Second	1	1		3	4/ 3	3/13	1.3	1.3		.27
	Third	1	1		3.5	3	3/13	1.1	1.1		.23
Cultivate tree rows (disk harrow)	5th-7th inc.	1		1	45	3	100	2.1		2.1	1.63
	8th-10th inc.	1		1	30	3	100	3.0		3.0	2.33
Hoe around trees	1st-4th inc.	1			16	2	100	4.8			.48
Harrow (disk-fall)	1st-10th inc.	1		1	16	1	3/13-40	1.6		1.6	1.24
Apply fertilizer for cover crop	do.	3	2		14	1	3/13-40	5.7	3.8		.99
Seed cover crop	do.	1			20	1	3/13-40	1.3			.13
Disk in cover-crop seed	do.	1		1	16	1	3/13-40	1.6		1.6	1.24
Prune	2nd-10th inc.						100	4.9			.49
Remove pruned wood	5th-10th inc.						100	2.2	4.4		.71
Supervision	1st-10th inc.						100	12.9			3.23
Miscellaneous 5/	do.						100	4.1	1.3		.56
Total								85.7	58.3	9.9	23.62

1/ Based on trees set 60 by 60 feet or 12 to the acre and on cotton alternated with peanuts and corn for harvest grown up to but not including the tree row for the first 4 years. Tree-row spaces have a total width of about 16 feet for the following 3 years and 24 feet for the next 3 years. Tree-row space is cultivated independently from the fifth to tenth years; rest of space usually cropped in cotton, peanuts or corn for harvest.

2/ See p.22 for definition of "Rate of work per day".

3/ Charges for land preparation and seeding of cover crop prorated to pecan trees on the basis of the land area used by the trees. These charges to pecan trees are: First 4 years, 13 percent; following 3 years, 27 percent; and next 3 years, 40 percent. Percentage charges to pecan trees for cultivation are the same as for land preparation for the first 4 years and 100 percent from the fifth to the tenth years.

4/ Based on 2 cultivations with a weeder and 3 cultivations with a single stock.

5/ Includes orchard sanitation and replacing missing trees.

Table 29.- Alabama, Eufaula district: Cost per acre of developing a pecan orchard for the first 10 years, by years, according to an approved method and at cost rates prevailing in 1940

Item	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
Fertilizer around trees pounds		8	16	24	32	40	48	56	64	72
Labor and power:										
Man labor hours	15.8	6.9	6.0	8.1	6.7	7.1	7.2	9.2	9.3	9.4
Horse work Do.	6.7	4.0	3.6	5.1	5.0	5.2	5.5	7.6	7.7	7.9
Tractor work Do.	.3	.3	.3	.3	1.3	1.3	1.3	1.6	1.6	1.6
Labor and power:	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols
Man labor 1/	1.95	.85	.74	1.00	.85	.91	.92	1.17	1.18	1.1
Horse work 1/	.74	.44	.40	.56	.55	.57	.60	.84	.85	.87
Tractor work 1/	.20	.20	.20	.20	.84	.84	.84	1.04	1.04	1.0
Total	2.89	1.49	1.34	1.76	2.24	2.32	2.36	3.05	3.07	3.1
Materials:										
Trees @ 75¢ each	9.00									
Fertilizer around trees: @ $36 per ton		.14	.29	.43	.58	.72	.86	1.01	1.15	1.3
Fertilizer for cover crop @ $15 per ton 2/ 5/	.29	.29	.29	.29	.61	.61	.61	.90	.90	.9
Cover-crop seed 3/ 5/										
Hairy vetch @ 10¢ per pound	.26		.26		.54		.54		.80	
Austrian winter peas @ 5¢ per pound		.20		.20		.40		.60		.6
Miscellaneous 4/	.30	.60	.12	.05	.05	.05	.06	.06	.06	.0
Total	9.85	1.23	.96	.97	1.78	1.78	2.07	2.57	2.91	2.8
Other costs:										
Taxes 5/	.03	.03	.03	.03	.05	.05	.05	.08	.08	.0
Use of machinery 6/	.24	.16	.14	.19	.31	.31	.32	.42	.42	.4
Overhead 6/	1.91	.41	.34	.41	.60	.62	.66	.84	.90	.8
Total	2.18	.60	.51	.63	.96	.98	1.03	1.34	1.40	1.4
Total cost, exclusive of interest	14.92	3.32	2.81	3.36	4.93	5.08	5.46	6.96	7.38	7.3
Interest @ 5 percent 5/ 6/	.16	.89	1.10	1.30	1.67	2.01	2.36	2.88	3.37	3.9
Total cost	15.08	4.21	3.91	4.66	6.65	7.09	7.82	9.84	10.75	11.2
Cumulative cost 7/	15.08	19.29	23.20	27.86	34.51	41.60	49.42	59.26	70.01	81.2

1/ Ordinary labor charged at 10 cents, tractor operator at 12½ cents, supervision at 25 cents, horse work at 11 cents, and tractor work at 65 cents an hour.

2/ Based on 16 percent superphosphate applied for cover crop at the rate of 300 pounds an acre.

3/ Based on Hairy vetch alternated with Austrian winter peas; Hairy vetch seeded a the rate of 20 pounds and Austrian winter peas at the rate of 30 pounds an acre.

4/ Includes trees for replanting and other miscellaneous materials.

5/ Charges for fertilizer for cover crop, cover-crop seed, taxes, and interest prorated to pecan trees on the basis of the land area used by the trees. These charge to pecan trees are: First 4 years, 13 percent; following 3 years, 27 percent; and the next 3 years, 40 percent.

6/ See p. 22 for method of computing machinery, overhead, and interest charges.

7/ Does not in this case include any sum for initial value of land.

Table 30.- Alabama, Eufaula district: Annual labor and power cost per acre of operating pecan orchards 15 to 19 years old 1/ with a yield of 85 pounds per acre according to a common method and at cost rates prevailing in 1940 2/

Operation	Labor and power			Rate of work per day	Times done	Percentage charged to pecans	Charged to pecans			
	Man	Horse	Tractor				Man labor	Horse work	Tractor work	Cost
	Number	Number	Number	Orchard acres	Number	Percent	Hours	Hours	Hours	Dollars
Plow	1	2		1.5	1	45	3.0	6.0		.96
Harrow	1		1	16.0	1	45	.3		.3	.23
Cultivate	1	1		3.0	6	45	9.0	9.0		1.89
Harvest: 3/										
Thresh and pick				4/		100	13.8			5/1.28
Haul to storage, dry and sack						100	1.5	1.3		6/ .29
Supervision						100	5.5			1.38
Miscellaneous 7/						100	1.2	1.2	.6	.88
Total							36.5	17.5	.9	6.91

1/ Trees set 60 by 60 feet, or 12 to the acre. There is now about 83 percent of a full stand.

2/ Ordinary labor charged at 10 cents, tractor operator at 12½ cents, supervision at 25 cents, horse work at 11 cents, and tractor work at 65 cents an hour.

3/ Based on pecans sold at the farm to local or other wholesale buyers.

4/ Pecan trees are usually threshed 1 time and the orchard is gone over about 3 times in picking up nuts. Threshing is at the rate of 20 trees per man per day and picking at an average rate of 100 pounds per man per day.

5/ Based on a contract rate of 1½ cents per pound for threshing trees and picking up nuts.

6/ Based on 1.75 man hours and 1.5 horse hours per 100 pounds of pecans produced.

7/ Includes 1.4 man hours and 0.6 horse hours for pruning and removing pruned wood, 1.0 man hours and 0.4 tractor hours for spraying, 1.0 man hours, 0.6 horse hours and 0.2 tractor hours for applying fertilizer, seeding cover crop, and orchard sanitation.

Table 31.- Alabama, Eufaula district: Annual cost of operating pecan orchards 15 to 19 years old 1/ according to a common method and at cost rates prevailing in 1940

Item	Quantity per acre	Cost per acre
	Pounds	Dollars
Yield per acre	85	
Labor and power:		
Preharvest	Hours	
Man labor	18.5	2.29
Horse work	16.2	1.78
Tractor work	.9	.58
Total		4.65
Harvest 2/		
Man labor	13.0	2.12
Horse work	1.3	.14
Total		2.26
Materials:	Number	
Sacks	.85	.04
Miscellaneous 3/		1.40
Total		1.44
Other costs:		
Taxes 4/		.09
Use of machinery, not including tractor 5/		.90
Overhead 5/		1.25
Total		2.24
Total cost, exclusive of interest		10.59
Interest at 5 percent 4/ 5/		4.63
Total cost		15.22
		Cost per pound
Cost per pound, exclusive of interest		.125
Cost per pound, inclusive of interest		.179
Quantity of nuts at 12 cents per pound 6/ required to cover cost per acre -	Pounds	
Exclusive of interest	88	
Inclusive of interest	127	

1/ Trees set 60 by 60 feet or 12 to the acre. There is now about 33 percent of a full stand.
2/ Based on pecans sold at the farm to local or other wholesale buyers.
3/ Includes $0.75 for commercial fertilizer, $0.45 for cover-crop seed, and $0.20 for spray material.
4/ Forty-five percent of the charge for taxes and interest is charged to pecans.
5/ See p. 22 for method of computing machinery, overhead, and interest charges.
6/ The 1940 State average farm price.

The total cost of producing an acre of pecans excluding interest amounted to approximately $10.60 an acre and 12.5 cents per pound; including interest it was $15.25 an acre and 18 cents per pound. The 5-year average yield for the district was less than enough to cover the cost an acre either with or without interest. Fifty-three percent of the orchards of bearing age (10 years old and older) surveyed in the district did not have yields sufficient to cover costs excluding interest charges; and 73 percent of these orchards did not have yields sufficient to cover costs including interest charges.

Cotton has long been, and still is, the chief cash crop in the district centering around Eufaula. With decreased cotton yields caused by the boll weevil and in some cases by the depletion of soil fertility, considerable attention was given to pecan planting with a view to supplementing the income from cotton or in some cases as a major commercial enterprise intended to furnish all or a large part of the farm income. Rather extensive plantings were made in the period 1915 to 1925 and much of this acreage was sold to absentee owners. Many of these holdings of absentee owners were neglected and in some cases have been partially or wholly abandoned. Much of the land is of a sandy nature and not particularly fertile and the growing of interplanted crops for harvest in bearing orchards has tended to deplete the humus content of these soils. Then too the difficulty of using a leguminous cover crop before cotton has curtailed the yields of pecans.

Here, as in other districts, it is well to remember that conditions that handicap one crop may also militate against another crop introduced. It should be realized that pecan trees like cotton are affected by diseases, insect pests, and adverse weather conditions, and that soil fertility is just as important for successful pecan orchards as for successful cotton or other crops. Of the orchards from which records were obtained by personal visits only two were sprayed; in these 67 percent of the sprayed trees were of the Schley variety.

Successful orchardists have recognized the necessity of planting the trees only on fertile land and of maintaining that fertility to meet the requirements of the growing trees and the intercrops. The most important factors in this district are the selection of a suitable, fertile site for the orchard, the choice of varieties adapted to the area and resistant to disease; the planting of trees at distances that will permit a good development of the orchard and following the necessary orchard practices of cultivation, fertilization, and control measures for insects and diseases, with a view to obtaining the maximum production compatible with sound economy.

Mobile District

Orchards studied in the Mobile district are all in Mobile County. Many of the bearing orchards now standing in this district were developed with Satsuma orange trees as fillers at the rate of 8 orange trees to 1 pecan tree, making 12 pecan and 96 Satsuma trees to an acre. A succession of severe winter freezes has almost eliminated the Satsumas. The general system of orchard development as shown in this report is based on an interplanted crop of corn for 2 successive years alternated with vegetables or some other crop for harvest the third year, with crotolaria seeded in the last cultivation of corn in years when corn follows corn. These interplanted crops are grown with the usual free spaces as the orchard develops. In the spring the orchard acreage is plowed and planted to field crops. After an application of fertilizer around the trees the interplanted crops are cultivated with one-horse cultivators, the trees receiving the same cultivation as that given the interplanted crop for the first 4 years. For the remainder of the development period the free space on each side of the tree row is cultivated independently with tractor-drawn disk harrows.

During the first 10 years of growth, a total of about 78 man hours, 18 horse hours, and 12 tractor hours were used to plant, fertilize the trees, cultivate, seed cover crops, prune, and care for the trees. At rates prevailing in 1940, the labor and power costs amounted to about $23 an acre (table 32). In 1940, pecan-orchard land was valued at $35 an acre. The cost of trees, labor and power, fertilizer, cover-crop seed, taxes, interest and other items chargeable to the trees, plus the value of the land on which the trees were planted amounted to about $50 an acre for the first year. At the end of 10 years, the total cost (including interest on the investment compounded annually and $35 for land) amounted to $117.83 an acre (table 33).

Field crops for harvest are usually not grown in bearing orchards. The management varies from pasturing livestock and leaving the orchards, for the most part, uncultivated to giving them reasonably good care. Winter cover crops were used in some of the orchards located on the better drained upland soils; they include Austrian peas and hairy vetch used separately or in a combination mixture with either rye or oats. The summer cover consisted almost entirely of crotolaria which was allowed to mature and reseed. Under this system of orchard management and with two cultivations with tractor-drawn disk harrows and an average yield of 86 pounds of nuts an acre, the care of an acre of pecan orchard including harvesting takes the equivalent of about 2.5 days of man labor and slightly less than 2 hours each of horse work and tractor work (table 34).

The total cost excluding interest was about $8.50 an acre and 10 cents per pound; including interest it was approximately $14.50 an acre and 17 cents per pound (table 35). The quantity of nuts per acre at the State average farm price of 12 cents per pound in 1940 required to cover costs excluding interest was 15 pounds less than the 5-year average yield but including interest it was 35 pounds in excess of the 5-year average yield. Of the orchards of bearing age surveyed in the district, 15 percent did not have yields sufficient to cover costs, excluding interest charges; and 65 percent did not have yields sufficient to pay costs including interest charges.

Several factors in the Mobile district have operated singly or in combination in bringing about low yields. Absentee ownership, which is often associated with inadequate financing of the enterprise during the development stage or after the trees came into bearing, accounts in some cases for the neglect and resultant low yields.

Another handicap at the outset was the close planting of trees; this was especially true in orchards that are now 20 years old or older. Most of these orchards were set at the rate of 17 or more trees an acre and few of the excess trees have been removed.

Failure to give proper consideration to soil and topography has often placed orchards on sites where it is difficult if not impossible to secure economic yields. The flat, poorly drained, sandy soils near the Gulf of Mexico have a high water table and they flood so badly in winter that it is impossible to grow a winter cover crop successfully. On the other hand, the better drained upland soils some distance away from the Gulf are rather suitable for pecan production.

Table 32. - Alabama, Mobile district: Labor and power cost per acre of developing a pecan orchard during the first 10 years, according to an approved method 1/ and at cost rates prevailing in 1940

Operation	Years operation is performed	Labor and power: Man	Labor and power: Horse	Labor and power: Tractor	Rate of work per day 2/	Times done each year	Percentage charged to pecans	Charged to pecans: Man labor	Charged to pecans: Horse work	Charged to pecans: Tractor work	Cost
		Number	Number	Number	Orchard acres	Number	Percent	Hours	Hours	Hours	Dollars
Plow	1st-10th inc.	1		1	4.5	1	3/ 13-40	5.7		5.7	4.85
Harrow (disk)	do.	1		1	16	1	3/ 13-40	1.6		1.6	1.36
Plant:											
Set stakes	First	3			25	1	100	1.2			.15
Dig holes	do.	2			7	1	100	2.9			.36
Set trees	do.	5	2		14	1	100	3.6	1.4		.60
Apply fertilizer around trees	Second	3	2		45	1	100	.7	.4		.13
	Third	3	2		40	1	100	.8	.5		.16
	Fourth	3	2		35	1	100	.9	.6		.18
	Fifth	3	2		30	1	100	1.0	.7		.20
	Sixth	3	2		28	1	100	1.1	.7		.22
	Seventh	3	2		26	1	100	1.2	.8		.24
	Eighth	3	2		24	1	100	1.2	.8		.24
	Ninth	3	2		22	1	100	1.4	.9		.27
	Tenth	3	2		20	1	100	1.5	1.0		.30
Cultivate	1st-4th inc.	1	1		3.5	3	3/ 13	4.4	4.4		1.03
Cultivate tree rows	5th-7th inc.	1		1	45	3	100	2.1		2.1	1.79
	8th-10th inc.	1		1	30	3	100	3.0		3.0	2.55
Hoe around trees	1st-4th inc.	1			15	2	100	5.2			.65
Apply fertilizer around trees	1st-4th inc.	3	2		14	1	3/ 13	.6	.4		.12
	7th	3	2		14	1	3/ 27	.6	.4		.12
	Tenth	3	2		14	1	3/ 40	.9	.6		.18
Seed crotolaria	1st-4th inc.	1			20	1	3/ 13	.2			.03
	Seventh	1			20	1	3/ 27	.1			.01
	Tenth	1			20	1	3/ 40	.2			.03
Prune	2nd-10th inc.						100	5.8			.73
Remove pruned wood	6th-10th inc.						100	3.3	3.3		.78
Supervision	1st-10th inc.						100	11.6			3.48
Miscellaneous 4/	do.						100	14.7	1.4		1.99
Total								77.5	18.3	12.4	22.75

1/ Based on trees set 60 by 60 feet or 12 to the acre and on corn interplanted for 2 successive years and alternated with vegetables or some other crop for harvest the third year. Crotolaria sown in the last cultivation of corn in years when corn follows corn. Interplanted crops grown up to but not including the tree row for the first 4 years. Tree-row spaces have a total width of about 16 feet for the following 3 years and 24 feet for the next 3 years. Tree-row space is cultivated independently from the fifth to tenth years.

2/ See p.22 for definition of "Rate of work per day."

3/ Charges for land preparation and seeding of cover crop prorated to pecan trees on the basis of the land area used by the trees. These charges to pecan trees are: First 4 years, 13 percent; following 3 years, 27 percent; and next 3 years, 40 percent. Percentage charges to pecan trees for cultivation are the same as for land preparation for the first 4 years and 100 percent from the fifth to the tenth years.

4/ Includes orchard sanitation and replacing missing trees.

Table 33.- Alabama, Mobile district: Cost per acre of developing a pecan orchard the first 10 years, by years, according to an approved method and at cost rates prevailing in 1940

Item	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
Fertilizer around trees pounds		24	48	72	96	120	144	168	192	216
Labor and power:										
Man labor hours	12.9	7.4	6.5	6.9	5.1	6.0	7.1	7.9	8.1	9.6
Horse work do.	2.7	1.9	1.8	2.1	.8	1.4	1.9	1.6	1.7	2.4
Tractor work do.	.4	.4	.4	.4	1.5	1.5	1.5	2.1	2.1	2.1
Labor and power:	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.
Man labor 1/	1.96	1.13	1.00	1.05	.82	.94	1.12	1.25	1.28	1.50
Horse work 1/	.30	.21	.20	.23	.09	.15	.21	.18	.19	.26
Tractor work 1/	.28	.28	.28	.28	1.05	1.05	1.05	1.47	1.47	1.47
Total	2.54	1.62	1.48	1.56	1.96	2.14	2.38	2.90	2.94	3.23
Materials:										
Trees @ 75¢ each	9.00									
Fertilizer around trees @ $25 per ton		.30	.60	.90	1.20	1.50	1.80	2.10	2.40	2.70
Fertilizer for cover crop @ $15 per ton 2/ 4/	.29			.29			.61			.90
Cover-crop seed (crotolaria) @ 10¢ per pound 2/ 4/	.26			.26			.54			.80
Miscellaneous 3/	.04	.54	.28	.15	.08	.08	.10	.08	.08	.08
Total	9.59	.84	.88	1.60	1.28	1.58	3.05	2.18	2.48	4.48
Other costs:										
Taxes 4/	.05	.05	.05	.05	.09	.09	.09	.14	.14	.14
Use of machinery 5/	.13	.10	.10	.11	.20	.22	.24	.30	.30	.32
Overhead 5/	1.82	.37	.35	.47	.49	.56	.81	.76	.81	1.16
Total	2.00	.52	.50	.63	.78	.87	1.14	1.20	1.25	1.62
Total cost, exclusive of interest	14.13	2.98	2.86	3.79	4.02	4.59	6.57	6.28	6.67	9.33
Interest @ 5 percent 4/ 5/	.26	.97	1.17	1.37	1.90	2.20	2.54	3.24	3.72	4.24
Total cost	14.39	3.95	4.03	5.16	5.92	6.79	9.11	9.52	10.39	13.57
Cost of development at end of each year 6/	49.39	53.34	57.37	62.53	68.45	75.24	84.35	93.87	104.26	117.83

1/ Ordinary labor charged at 12½ cents, tractor operator at 15 cents, supervision at 30 cents, horse work at 11 cents, and tractor work at 70 cents an hour.

2/ Based on crotolaria seeded at the last cultivation of corn in the first, fourth, seventh, and tenth years at the rate of 20 pounds an acre and on 16-percent superphosphate applied for summer cover crop at the rate of 300 pounds an acre.

3/ Includes trees for replanting and other miscellaneous materials.

4/ Charges for fertilizer for cover crop, cover-crop seed, taxes, and interest prorated to pecan trees on the basis of the land area used by the trees. The charges to pecan trees are: First 4 years, 13 percent; the following 3 years, 27 percent; and the next 3 years, 40 percent.

5/ See p. 22 for method of computing machinery, overhead, and interest charges.

6/ Total cost including interest plus initial value of land, at $35 an acre.

Table 34.- Alabama, Mobile district: Annual labor and power cost per acre of operating pecan orchards 15 to 19 years old 1/ with a yield of 86 pounds per acre according to a common method and at cost rates prevailing in 1940 2/

Operation	Labor and power			Rate of work per day	Times done	Man labor	Horse work	Tractor work	Cost
	Man	Horse	Tractor						
	Number	Number	Number	Orchard acres	Number	Hours	Hours	Hours	Dollars
Cultivate (disk harrow)	1		1	16	2	1.2		1.2	1.02
Harvest: 3/									
Thresh and pick				4/		14.0			5/1.29
Haul to storage dry and sack						1.5	1.3		6/ .33
Supervision						3.6			1.08
Miscellaneous 7/						3.8	.6	.4	.84
Total						24.1	1.9	1.6	4.56

1/ Trees set 60 by 60 feet or 12 to the acre. There is now about 90 percent of a full stand.

2/ Ordinary labor charged at 12½ cents, tractor operator at 15 cents, supervision at 30 cents, horse work at 11 cents, and tractor work at 70 cents an hour.

3/ Based on pecans sold at the farm to local or other wholesale buyers.

4/ Pecan trees are usually threshed 1 time and the orchard is gone over about 3 times in picking up nuts. Threshing is at the rate of 20 trees per man per day, and picking at an average rate of 100 pounds per man per day.

5/ Based on a contract rate of 1½ cents per pound for threshing trees and picking up nuts.

6/ Based on 1.75 man hours and 1.5 horse hours per 100 pounds of pecans produced.

7/ Includes 1.25 man hours for pruning, 1.25 man hours and 0.4 tractor hours for spraying, 1.3 man hours and 0.6 horse hours for applying fertilizer, seeding cover crop and orchard sanitation.

Table 35.- Alabama, Mobile district: Annual cost of operating pecan orchards 15 to 19 years old 1/ according to a common method and at cost rates prevailing in 1940

Item	Quantity per acre	Cost per acre
	Pounds	Dollars
Yield per acre	86	
Labor and power:		
Preharvest	Hours	
Man labor	5.9	0.94
Horse work	.6	.07
Tractor work	1.6	1.12
Total		2.13
Harvest 2/		
Man labor	13.2	2.29
Horse work	1.3	.14
Total		2.43
Materials:	Number	
Sacks	.36	.04
Miscellaneous 3/		2.05
Total		2.09
Other costs:		
Taxes		.35
Use of machinery, not including tractor 4/		.52
Overhead 4/		1.00
Total		1.37
Total cost, exclusive of interest		8.52
Interest at 5 percent 4/		6.02
Total cost		14.54
		Cost per pound
Cost per pound, exclusive of interest		.099
Cost per pound, inclusive of interest		.169
Quantity of nuts at 12 cents per pound 5/ required to cover cost per acre	Pounds	
Exclusive of interest	71	
Inclusive of interest	121	

1/ Trees set 60 by 60 feet or 12 to the acre. There is now about 90 percent of a full stand.

2/ Based on pecans sold at the farm to local or other wholesale buyers.

3/ Includes $1.16 for commercial fertilizer, $0.60 for cover-crop seed, and $0.29 for spray material.

4/ See p.22 for method of computing machinery, overhead, and interest charges.

5/ The 1940 State average farm price.

Very heavy rainfall and high humidity in the district are conducive to extensive disease infection, particularly in the many orchards planted to varieties that are very susceptible to scab and foliage diseases. Despite the seriousness of the disease situation, only one orchard was sprayed among the group from which records were obtained by personal visits. Orchard-sanitation work consisted mainly of an attempt to control web worms and caterpillars by hand methods.

On the better drained upland soils, an intelligently planned and well-executed system of orchard management adapted to the area would do much to improve the pecan situation. Such a system would include a systematic thinning of all trees that are planted too closely and the adoption of the cultural practices, which, in conjunction with soil upkeep and the control of diseases and insect pests, are most likely to obtain economic yields. The removal of excess trees would improve air circulation, aid in the control of disease, and improve the yield of the remaining trees.

Mississippi

Gulf Coast District

Orchards studied in the Gulf Coast district of Mississippi are about equally divided between Harrison and Jackson Counties. The cost of developing a pecan orchard in this district is based on an interplanted crop for harvest grown in the orchard during the entire development period. The orchard-development program provides for interplanted crops, mainly corn and vegetables.

In the spring the orchard acreage is plowed and planted to field crops. Following an application of fertilizer around the trees, the interplanted crops and trees are cultivated with one-horse cultivators for the first 4 years. After the fourth year, the free tree-row space (increased to 24 feet by the seventh year) is cultivated with tractor-drawn disk harrows. During the first 10 years of growth, a total of about 81 man hours, 54 horse hours, and 7 tractor hours were used to plant, fertilize the trees, cultivate, prune, and care for the trees. At rates prevailing in 1940, the labor and power costs for the first 10 years amounted to about $22.50 an acre (table 36).

Pecan-orchard land was valued at about $35 an acre in 1940. Trees for planting 60 feet each way cost $9 (12 trees at 75 cents each). The cost of trees, labor and power, fertilizer, and other items chargeable to the trees, plus the value of the land on which the trees were planted amounted to about $49 an acre for the first year. At the end of 10 years the total cost, including interest on the investment compounded annually, and $35 for land, amounted to $114.53 an acre (table 37).

Many bearing orchards in this district are receiving little, if any, attention. Sedge grass is now firmly established in some and others are in Bermuda and carpet grass pastured with livestock. A few orchardists had a winter cover crop of Austrian winter peas, vetch, or oats, and some had a summer cover of velvet beans or cowpeas which are usually grazed or harvested. Soil and climatic conditions near the Gulf coast are not favorable to cover crops. Field crops are usually not interplanted in bearing orchards. Although perhaps a majority of the orchards are receiving indifferent care; the cost estimates are for those that are receiving reasonably good attention.

Table 36. - Mississippi, Gulf Coast: Labor and power cost per acre of developing a pecan orchard during the first 10 years, according to an approved method 1/ and at cost rates prevailing in 1940

Operation	Years operation is performed	Labor and power: Man	Labor and power: Horse	Labor and power: Tractor	Rate of work per day 2/	Times done each year	Percentage charged to pecans	Charged to pecans: Man labor	Charged to pecans: Horse work	Charged to pecans: Tractor work	Cost
		Number	Number	Number	Orchard acres	Number	Percent	Hours	Hours	Hours	Dollars
Plow	1st-10 inc.	1	2		1.5	1	3/13-40	17.1	34.2		5.56
Harrow (disk)	do.	1		1	16	1	3/13-40	1.6		1.6	1.36
Plant:											
Set stakes	First	3			25	1	100	1.2			.15
Dig holes	do.	2			7	1	100	2.9			.36
Set trees	do.	5	2		14	1	100	3.6	1.4		.59
Apply fertilizer around trees	Second	3	2		45	1	100	.7	.4		.13
	Third	3	2		40	1	100	.8	.5		.15
	Fourth	3	2		35	1	100	.9	.6		.17
	Fifth	3	2		30	1	100	1.0	.7		.20
	Sixth	3	2		28	1	100	1.1	.7		.21
	Seventh	3	2		26	1	100	1.2	.8		.23
	Eighth	3	2		24	1	100	1.2	.8		.23
	Ninth	3	2		22	1	100	1.4	.9		.26
	Tenth	3	2		20	1	100	1.5	1.0		.29
Cultivate	1st-4th inc	1	1		3.5	3	3/ 13	4.4	4.4		.99
Cultivate tree rows (disk harrow)	5th-7th inc	1		1	45	3	100	2.1		2.1	1.78
	8th-10th inc	1		1	30	3	100	3.0		3.0	2.55
Hoe around trees	1st-4th inc	1			15	2	100	5.2			.65
Prune	2nd-10th inc						100	6.9			.86
Remove pruned wood	5th-10th inc						100	3.0	6.0		.98
Supervision	1st-10th inc						100	12.1			3.63
Miscellaneous 4/	do.						100	8.0	1.4		1.14
Total								80.9	53.8	6.7	22.47

1/ Based on trees set 60 by 60 feet or 12 to the acre and on interplanted crops, mainly corn and vegetables, grown up to but not including the tree row for the first 4 years. Tree-row spaces have a total width of about 16 feet for the following 3 years and 24 feet for the next 3 years. For the first 4 years tree-row spaces are cultivated the same as the interplanted crops. From the fifth to the tenth years tree-row spaces are cultivated independently.

2/ See p.22 for definition of "Rate of work per day."

3/ Charges for land preparation prorated to pecan trees on the basis of the land area used by the trees. These charges to pecan trees are: First 4 years, 13 percent; following 3 years, 27 percent; and next 3 years, 40 percent. Percentage charge to pecan trees for cultivation are the same as for land preparation for the first 4 years and 100 percent from the fifth to the tenth years.

4/ Includes orchard sanitation and

Table 37.- Mississippi, Gulf Coast district: Cost per acre of developing a pecan orchard for the first 10 years, by years, according to an approved method and at cost rates prevailing in 1940

Item		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
Fertilizer	pounds		24	48	72	96	120	144	168	192	216
Labor and power:											
Man labor	hours	14.0	6.6	6.5	6.6	6.8	6.8	7.2	8.7	8.8	8.9
Horse work	Do.	4.5	3.5	3.5	3.6	5.5	5.4	5.5	7.4	7.4	7.5
Tractor work	Do.	.1	.1	.1	.1	.9	.9	.9	1.2	1.2	1.2
Labor and power:		Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.
Man labor 1/		2.12	1.00	.99	1.00	1.05	1.05	1.12	1.34	1.36	1.37
Horse work 1/		.45	.35	.35	.36	.55	.54	.55	.74	.74	.7
Tractor work 1/		.07	.07	.07	.07	.63	.63	.63	.84	.84	.8
Total		2.64	1.42	1.41	1.43	2.23	2.22	2.30	2.92	2.94	2.9
Materials:											
Trees @ 75¢ each		9.00									
Fertilizer @ $25 per ton			.30	.60	.90	1.20	1.50	1.80	2.10	2.40	2.70
Miscellaneous 2/		.30	.64	.26	.10	.49	.13	.11	.31	.16	.21
Total		9.30	.94	.86	1.00	1.69	1.63	1.91	2.41	2.56	2.91
Other costs:											
Taxes 3/		.05	.05	.05	.05	.09	.09	.09	.14	.14	.14
Use of machinery 4/		.15	.12	.12	.12	.27	.27	.27	.37	.37	.37
Overhead 4/		1.79	.35	.34	.36	.59	.58	.63	.80	.82	.8
Total		1.99	.52	.51	.53	.95	.94	.99	1.31	1.33	1.3
Total cost, exclusive of interest		13.93	2.88	2.78	2.96	4.87	4.79	5.20	6.64	6.83	7.2
Interest @ 5 percent 3/ 4/		.26	.97	1.16	1.36	1.86	2.19	2.54	3.18	3.67	4.20
Total cost		14.19	3.85	3.94	4.32	6.73	6.98	7.74	9.82	10.50	11.4
Cost of development at end of each year 5/		49.19	53.04	56.98	61.30	68.03	75.01	82.75	92.57	103.07	114.63

1/ Ordinary labor charged at 12½ cents, tractor operator at 15 cents, supervision at 30 cents, horse work at 10 cents, and tractor work at 70 cents an hour.

2/ Includes trees for replanting and other miscellaneous materials.

3/ Charges for taxes and interest prorated to pecan trees on the basis of the land area used by the trees. These charges to pecan trees are: First 4 years, 13 percent; following 3 years, 27 percent; and next 3 years, 40 percent.

4/ See p. 22 for method of computing machinery, overhead, and interest charges.

5/ Total cost including interest plus initial value of land at $35 an acre.

An orchard-management program based on breaking the land in the spring with a two-horse turning plow and two cultivations with tractor-drawn disk harrows during the season, and with a yield of 75 pounds of nuts an acre, used about 3 days of man labor, 1.5 days of horse work, and about 1.5 hours of tractor work to care for and harvest an acre of nuts (table 38). The total cost of producing a acre of pecans excluding interest amounted to approximately $9.65 an acre or 12.9 cents per pound; including interest it was $15.53 an acre and 20.7 cents per pound (table 39).

The 5-year average yield for the district was 11 pounds in excess of the quantity necessary to cover the cost of an acre excluding interest, but it was 28 pounds less than the quantity necessary to cover the cost of an acre including interest.

Production records for 35 orchards of bearing age (10 years old and older) ranged from 2 pounds to 400 pounds an acre. Approximately 39 percent of these orchards did not have yields sufficient to cover costs excluding interest charges; and 51 percent did not have yields sufficient to cover costs including interest charges (table 39).

The most common reasons given for low yields obtained in many orchards were the planting of varieties unsuited to the district, lack of soil fertility, poor drainage, uncontrolled insect pests and fungus diseases, trees planted too close, and neglect of the orchard during the development period. Many orchards are planted to Schley, Success, and other varieties very susceptible to scab. This situation, coupled with the very heavy rainfall and high humidity in the district, is very conducive to scab infection. On orchards surveyed no spraying was done and sanitation measures consisted almost entirely of an effort to control caterpillars and web worms by hand methods. Many orchards are in Bermuda and carpet grass and pastured with livestock. Although these and other factors discussed for the other districts must be given due consideration, differences in orchard sites with reference to soil fertility and surface features constitute one of the most important factors contributing to the wide range in yields in this district. The soils vary greatly in their ability to produce profitable pecan crops. The flat, poorly-drained gray soils near the Gulf Coast are of low agricultural value; winte cover crops cannot be grown successfully on these soils because they flood out in winter. In other sections the red waxy clay subsoil, often impervious, is too close to the surface to permit deep rooting of the trees and easy cultivation. Th most successful orchards in the district are on the well-drained sandy loam soils having subsoils of friable yellow or reddish sandy or fine sandy clays.

Louisiana

Shreveport District

Orchards studied in the Shreveport district of Louisiana are in Caddo, Bossier, and Natchitoches Parishes, the majority being in the first two parishes. The orchard-development program calls for cotton alternated with corn for harvest grown in the orchard during the entire development period. These crops are grown up to, but not including, the tree row for the first 4 years. Tree-row spaces have a total width of about 16 feet from the fifth to the seventh years, and 24 feet for the next 3 years and are cultivated independently of the interplanted cro

Table 38.- Mississippi, Gulf Coast: Annual labor and power cost per acre of operating pecan orchards 15 to 19 years old 1/ with a yield of 75 pounds per acre according to a common method and at cost rates prevailing in 1940 2/

Operation	Labor and power: Man	Labor and power: Horse	Labor and power: Tractor	Rate of work per day	Times done	Man labor	Horse work	Tractor work	Cost
	Number	Number	Number	Orchard acres	Number	Hours	Hours	Hours	Dollars
Plow	1	2		1.5	1	6.7	13.4		2.13
Cultivate (disk harrow)	1		1	13.0	2	1.2		1.2	1.02
Harvest: 3/									
Thresh and pick				4/		12.8			5/ 1.12
Haul to storage, dry and sack						1.3	1.1		6/ .27
Haul to market (8 miles)						.1			7/ .05
Supervision						4.6			1.38
Miscellaneous 8/						4.2	.3	.2	.70
Total						30.9	14.8	1.4	6.72

1/ Trees set 60 by 60 feet or 12 to the acre. There is now about 88 percent of a full stand.
2/ Ordinary labor charged at 12½ cents, tractor operator at 15 cents, supervision at 30 cents, horse work at 10 cents, and tractor work at 70 cents an hour.
3/ Based on pecans sold to local or other wholesale buyers and delivered to local shipping point.
4/ Pecan trees are usually threshed 1 time, and the orchard is gone over about 3 times in picking up nuts. Threshing is at the rate of 100 pounds per man per day, and picking at an average rate of 1½ cents per man per day.
5/ Based on a contract rate of 1½ cents per pound for threshing trees and picking up nuts.
6/ Based on 1.75 man hours and 1.5 horse hours per 100 pounds of pecans produced.
7/ Based on the use of motor truck at 10 cents per mile, and on 1 man hauling 3,000 pounds of pecans per load or 9,000 pounds per day.
8/ Includes 0.7 man hours for pruning, 3.0 man hours for orchard sanitation, and 0.5 man hours, 0.3 horse hours, and 0.2 truck hours for seeding cover crop and applying fertilizer.

Table 39.- Mississippi, Gulf Coast district: Annual cost of operating pecan orchards 15 to 19 years old 1/ according to a common method and at cost rates prevailing in 1940

Item	Quantity per acre	Cost per acre
	Pounds	Dollars
Yield per acre	75	
Labor and power:		
Preharvest	Hours	
Man labor	14.2	2.18
Horse work	13.7	1.37
Tractor work	1.4	.98
Total		4.53
Harvest 2/		
Man labor	16.7	2.04
Horse work	1.1	.11
Truck work		.04
Total		2.19
Materials:	Numbers	
Sacks	.75	.04
Miscellaneous 3/		.80
Total		.84
Other costs:		
Taxes		.35
Use of machinery, not including tractor or truck 4/		.61
Overhead 4/		1.13
Total		2.09
Total cost, exclusive of interest		9.65
Interest at 5 percent 4/		5.38
Total cost		15.53
		Cost per pound
Cost per pound, exclusive of interest		.129
Cost per pound, inclusive of interest		.207
Quantity of nuts at 15.1 cents per pound 5/ required to cover cost per acre	Pounds	
Exclusive of interest	64	
Inclusive of interest	103	

1/ Trees set 60 by 60 feet or 12 to the acre. There is now about 33 percent of a full stand.

2/ Based on pecans sold to local or other wholesale buyers and delivered to local shipping point.

3/ Includes $0.60 for cover-crop seed, and $0.20 for commercial fertilizer.

4/ See p. 22 for method of computing machinery, overhead, and interest charges.

5/ The 1940 State average farm price.

In the spring the orchard acreage is plowed and planted to field crops. For the first 4 years the interplanted crops and tree rows are cultivated with two-horse cultivators. From the fifth to the tenth years the free tree-row space is cultivated independently with tractor-drawn disk harrows.

During the first 10 years of growth, a total of about 45 man hours, 15 horse hours, and 10 tractor hours are used to plant, cultivate, and care for the trees. At rates prevailing in 1940, the labor and power costs for the first 10 years amounted to about $13.50 an acre (table 40). The total cost for the first 10 years, excluding the cost or value of the land, amounted to $54.48 an acre (table 41).

Bearing orchards in this district are handled in a variety of ways. In the older orchards it is not uncommon to clean cultivate the tree rows and grow a crop of Melilotus indica or white Dutch clover in the centers which may be cut for hay or harvested for the seed. In orchards 15 to 19 years old, it is a common practic to grow an interplanted crop for harvest mainly cotton or corn. Most orchardists leave tree-row spaces which are cultivated independently of the intercrops. With an interplanted crop for harvest, a 15-foot free space on each side of the tree row, and a yield of 265 pounds of nuts an acre, about 3.5 days of man-labor, one-half day of horse work, and one-fourth day of tractor work were used in the care and harvest of an acre of nuts (table 42).

The total cost of producing an acre of pecans exclusive of interest, amounted to approximately $9.25 an acre, and 3.5 cents per pound; including interest at 5 percent it was $14.37 an acre and 5.4 cents per pound (table 43). The 5-year average yield for the district was very materially in excess of the quantity necessary to cover the cost an acre both with and without interest.

Production records for the district for trees of bearing age (10 years old and older) showed a 5-year average yield that ranged from less than 2 pounds per tree for the orchard having the lowest yield to 64 pounds per tree for the orchard having the highest. On an acre basis 90 percent of the orchards included in the study had yields sufficient to cover costs excluding interest charges, and 89 percent had yields sufficient to cover costs including interest charges as shown in table 43.

The alluvial soil of the area, on which the larger number of the orchards studied are located, is well adapted to cotton and corn. The normally favorable yields have resulted in a relatively high valuation of the land. The investment is big enough to make it particularly desirable to get some income from the land while the trees are developing. The planting of fewer trees to the acre not only permits the interplanting of field crops in the orchard during the development period but also allows a continuation of this practice until the size of the trees prevents a profitable production of such crops. In most cases orchardists feel that this point has not been reached in orchards from 15 to 19 years old. When the size of tree becomes such that it is no longer advisable to grow an interplanted crop for harvest, the sole income from the land, of an initial value of $100 an acre, will be from pecans.

With land of this value, the yield of pecans must be high in order to compete with cotton. The small quantity of nuts required to pay costs (as shown in table 43) represents orchards in which the trees have not attained a size that prohibits the growing of cotton in the orchard and in which the cotton crop is

Table 40.- Louisiana, Shreveport district: Labor and power cost per acre of developing a pecan orchard during the first 10 years, according to an approved method 1/ and at cost rates prevailing in 1940

Operations	Years operation is performed	Labor and power			Rate of work per day 2/	Times done each year	Percentage charged to pecans	Charged to pecans			Cost
		Man	Horse	Tractor				Man labor	Horse work	Tractor work	
		Number	Number	Number	Orchard acres	Number	Percent	Hours	Hours	Hours	Dols.
Plow	1st-10th inc.	1		1	6.5	1	3/12-36	3.8		3.8	2.75
Harrow (disk)	do.	1		1	18	2	3/12-36	2.5		2.5	1.81
Plant:											
Set stakes	First	3			30	1	100	1.0			.10
Dig holes	do.	1			3.5	1	100	2.9			.29
Set trees	do.	7	2	-	24	1	100	2.9	.8		.37
Cultivate	1st & 3rd	1	2		6	6	3/ 12	2.4	4.8		.72
	2nd & 4th	1	2		6.5	3	3/ 12	1.2	2.4		.36
Cultivate tree rows (disk harrow)	5th-7th inc.	1		1	55	3	100	1.5		1.5	1.09
	8th-10th inc.	1		1	38	3	100	2.4		2.4	1.74
Hoe around trees	1st & 2nd	1			20	2	100	2.0			.20
	3rd & 4th	1			18	2	100	2.2			.22
Prune	2nd-10th inc.						100	5.8			.58
Remove prunedwood	5th-10th inc.						100	2.8	5.6		.84
Supervision	1st-10th inc.						100	6.8			1.70
Misc. 4/	do.						100	5.3	1.0		.63
Total								45.5	14.6	10.2	13.40

1/ Based on trees set 66 by 66 feet or 10 to the acre and on cotton alternated with corn for harvest. Interplanted crops grown up to but not including the tree row for the first 4 years. Tree-row spaces have a total width of about 16 feet for the following 3 years, and 24 feet for the next 3 years. For the first 4 years tree-row spaces cultivated the same as the interplanted crop. From the fifth to the tenth years tree-row spaces are cultivated independently.

2/ See p.22 for definition of "Rate of work per day."

3/ Charges for land preparation prorated to pecan trees on the basis of the land area used by the trees. These charges to pecan trees are as follows: First 4 years 12 percent; following 3 years, 24 percent; and next 3 years, 36 percent. Percentage charges to pecan trees for cultivation are the same as for land preparation for the first 4 years and 100 percent from the fifth to the tenth years.

4/ Includes orchard sanitation and replacing missing trees.

Table 41.- Louisiana, Shreveport district: Cost per acre of developing a pecan orchard for the first 10 years, by years, according to an approved method and at cost rates prevailing in 1940

Item		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
Labor and power:											
Man labor	hours	11.6	4.0	4.1	3.7	3.3	3.2	3.2	4.1	4.1	4.2
Horse work	Do.	3.4	1.4	2.5	1.3	.9	.9	.9	1.1	1.0	1.2
Tractor work	Do.	.3	.3	.3	.3	1.2	1.2	1.2	1.8	1.8	1.8
Labor and power:		Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.
Man labor 1/		1.42	.50	.51	.47	.44	.42	.42	.54	.54	.56
Horse work 1/		.34	.14	.25	.13	.09	.09	.09	.11	.10	.12
Tractor work 1/		.18	.18	.18	.18	.72	.72	.72	1.08	1.08	1.08
Total		1.94	.82	.94	.78	1.25	1.23	1.23	1.73	1.72	1.76
Materials:											
Trees @ 75¢ each		7.50									
Miscellaneous 2/		.20	.75	.35	.20	.20	.35	.40	.34	.10	.10
Total		7.70	.75	.35	.20	.20	.35	.40	.34	.10	.10
Other costs:											
Taxes 3/		.07	.07	.07	.07	.13	.13	.13	.20	.20	.20
Use of machinery 4/		.14	.08	.11	.08	.17	.17	.17	.25	.25	.25
Overhead 4/		1.45	.24	.19	.15	.22	.24	.24	.31	.27	.28
Total		1.66	.39	.37	.30	.52	.54	.54	.76	.72	.73
Total cost, exclusive of interest		11.30	1.96	1.66	1.28	1.97	2.12	2.17	2.83	2.54	2.59
Interest @ 5 percent 3/ 4/		.64	1.22	1.38	1.53	2.29	2.50	2.74	3.60	3.92	4.24
Total cost		11.94	3.18	3.04	2.81	4.26	4.62	4.91	6.43	6.46	6.83
Cumulative cost 5/		11.94	15.12	18.16	20.97	25.23	29.85	34.76	41.19	47.65	54.48

1/ Ordinary labor charged at 10 cents, tractor operator at 12½ cents, supervision at 25 cents, horse work at 10 cents, and tractor work at 60 cents an hour.

2/ Includes trees for replanting and other miscellaneous materials.

3/ Charge for taxes and interest prorated to pecan trees on the basis of the land area used by the trees. These charges to pecan trees are: First 4 years, 12 percent; following 3 years, 24 percent; and next 3 years, 36 percent.

4/ See p. 22 for method of computing machinery, overhead, and interest charges.

5/ Does not in this case include any sum for initial value of land.

Table 42. - Louisiana, Shreveport district: Annual labor and power cost per acre of operating pecan orchards 15 to 19 years old 1/ with a yield of 265 pounds per acre according to a common method and at cost rates prevailing in 1940 2/

Operation	Labor and power			Rate of work per day	Times done	Percentage charged to pecans	Charged to pecans			
	Man	Horse	Tractor				Man labor	Horse work	Tractor work	Cost
	Number	Number	Number	Orchard acres	Number	Percent	Hours	Hours	Hours	Dollars
Plow	1		1	6.5	1	45	.7		.7	.51
Harrow	1		1	18.0	2	45	.5		.5	.36
Cultivate tree rows	1		1	30.0	3	100	1.0		1.0	.72
Harvest: 3/										
Thresh and pick				4/		100	19.4			5/ 1.99
Haul to storage, dry and sack						100	4.6	4.0		6/ .86
Haul to market (8 miles)						100	.3			7/ .18
Supervision						100	5.3			1.32
Miscellaneous 8/						100	3.8	.4	.2	.54
Total							35.6	4.4	2.4	6.48

1/ Trees set 66 by 66 feet, or 10 to the acre. There is now about 88 percent of a full stand.

2/ Ordinary labor charged at 10 cents, tractor operator at 12½ cents, supervision at 25 cents, horse work at 10 cents, and tractor work at 60 cents an hour.

3/ Based on pecans sold to local or other wholesale buyers and delivered to local shipping point.

4/ Pecan trees are usually threshed 1 time and the orchard is gone over about 3 times in picking up nuts. Threshing is at the rate of 20 trees per man per day, and picking up at an average rate of 175 pounds per man per day.

5/ Based on a contract rate of 3/4 cents per pound for threshing trees and picking up nuts.

6/ Based on 1.75 man hours and 1.5 horse hours per 100 pounds of pecans produced.

7/ Based on use of motor truck at 10 cents per mile and on 1 man hauling 3,000 pounds of pecans per load or 9,000 pounds per day.

8/ Includes 1.7 man hours and 0.4 horse hours for pruning and removing pruned wood and 2.0 man hours and 2.0 tractor hours for seeding cover crops, spraying, and orchard sanitation.

Table 43.- Louisiana, Shreveport district: Annual cost of operating pecan orchards 15 to 19 years old 1/ according to a common method and at cost rates prevailing in 1940

Item	Quantity per acre	Cost per acre
	Pounds	Dollars
Yield per acre	265	
Labor and power:		
Preharvest	Hours	
Man labor	7.1	0.92
Horse work	.4	.04
Tractor work	2.4	1.44
Total		2.40
Harvest 2/		
Man labor	28.5	3.54
Horse work	4.0	.40
Truck work		.14
Total		4.08
	Number	
Materials:		
Sacks	2.65	.26
Miscellaneous 3/		.63
Total		.89
Other costs:		
Taxes 4/		.25
Use of machinery, not including tractor or truck 5/		.54
Overhead 5/		1.11
Total		1.90
Total cost, exclusive of interest		9.27
Interest at 5 percent 4/ 5/		5.10
Total		14.37
		Cost per pound
Cost per pound, exclusive of interest		.035
Cost per pound, inclusive of interest		.054
Quantity of nuts at 13.2 cents per pound 6/ required to cover cost per acre	Pounds	
Exclusive of interest	70	
Inclusive of interest	109	

1/ Trees set 66 by 66 feet or 10 to the acre. There is now about 88 percent of a full stand.
2/ Based on pecans sold to local or other wholesale buyers and delivered to local shipping point.
3/ Includes $0.33 cover crop seed, and $0.30 for spray materials.
4/ Forty-five percent of the charge for taxes and interest is charged to pecans.
5/ See p.22 for method of computing machinery, overhead, and interest charges.
6/ The 1940 State average farm price.

charged with the major share of the joint costs. The general system of orchard management followed, with the yields obtained, on an orchard 40 years of age, is outlined briefly as an indication of a system of orchard management on an older orchard in which cotton is no longer interplanted.

The cultivation of this orchard consists of plowing strips about 30 feet wide on each side of the tree rows during the winter turning under the old leaves and shucks as a sanitation measure. Beginning in the spring, these strips are gone over with a disk cultivator about every other week until the latter part of July. The middles are allowed to grow up in sweetclover, mostly Melilotus indica, which reseeds itself annually. This leguminous growth is disked in during the first part of July, and the entire orchard is usually given two more diskings between that time and harvest. A very small part of the sweetclover is harvested for hay each year but most of it is used as a soil-improvement crop. Each spring an application of 10 pounds of cyanamid is made to each tree and they are sprayed for the control of obscure scale.

During the 17-year period 1923-39 inclusive, the orchard produced an average annual yield of 364 pounds of nuts an acre. This was an average yield of 52 pounds of pecans a tree, counting all trees originally planted as bearing trees. The orchard was originally planted at the rate of 6.9 trees to the acre, but it was estimated that approximately 13 percent of the trees were either missing or were nonbearing replants. The trees actually in bearing, therefore, produced an annual average of 68 pounds of nuts a tree during the 17-year period.

This area has relatively high yields per tree as compared to other districts studied. This is mainly due to the fertile, deep, and well-suited soil on which the orchards are generally located. Furthermore, the trees have been planted wide apart so that they have not become crowded at an early age. Under such conditions crop yields have generally increased as the trees became older and larger in size. However, many of the orchards have now attained such age that the trees have begun to crowd each other, diseases and insect pests have become well established and unless prompt and proper attention is given to correct these conditions crops will be uncertain and yields will decrease.

In several of the orchards, the stand of trees should be immediately reduced by one-half to give the remaining trees the space they need and as an aid in the control of insect pests and diseases. In too many cases, cultivation of the orchards is insufficient to keep weeds and grass under control, especially during dry periods, and this often results in poorly filled nuts at harvest.

More growers should practice orchard sanitation and spray to control scab and foliage diseases and insects that reduce the crop or cause defoliation of the trees.

DISCUSSION AND CONCLUSIONS

In the study upon which this report is based, 189 pecan farms, located in 9 of the important commercial pecan producing districts, were visited. Information gained by this method was supplemented by a mailed questionnaire to other growers throughout the pecan region. The study was confined to improved varieties only.

In the fall of 1931 pecan prices fell to approximately half of that of the previous season and since then the average farm price of nuts has not exceeded 14 cents a pound, excepting in 2 years. This greatly decreased price has resulted in many changes in the pecan industry. Few new orchards have been planted, many established orchards have been completely or partly abandoned and others have received indifferent care. However, other orchards have been given the attention needed to produce satisfactorily by growers who have realized that pecans require the same careful attention and good production practices as other horticultural crops.

Many orchards were established on unsuitable soils, - soils that either were not adequately drained or that consisted of rather deep, coarse sands, generally low in fertility and not responsive to good soil-management practices. Many of these orchards were abandoned. It is estimated that 90 percent of the improved varieties of pecans are grown on upland soils that are generally deficient in organic matter and nitrogen. For the most part, these upland soils are responsive to good soil-management practices and through proper use of fertilizers and cover crops can be maintained at a fairly high level of fertility.

Pecan production on a tree or acre basis can be materially increased through the use of a fertilizer and cover-crop program. The most effective way of getting phosphorus and potassium into pecan trees is through the growing of winter cover crops. Furthermore, the application of phosphorus and potassium-carrying fertilizers at the time of seeding greatly stimulates the yield of green manure. An appreciable number of growers interviewed planted nonlegume cover crops, particularly small grains which were pastured or in some instances used as a green-manure crop. This practice should be discouraged as it costs approximately as much as the better practice of growing legumes which also add nitrogen to the soil. Nitrogen is most often the element that limits soil fertility regulating the growth of trees and yield of nuts. Too few growers were found who made a regular practice of applying nitrogen-carrying fertilizers around the trees. This should be done in the spring about 2 weeks before tree growth starts. The value of such practices combined were demonstrated in an experiment conducted by the Florida Agricultural Experiment Station in a pecan orchard in which the organic matter of the soil was maintained by growing summer and winter leguminous manure crops adequately fertilized with superphosphate and potash, with sulphate of ammonia applied to the trees. This orchard produced an average yield of 648 pounds of nuts an acre. Another plot on which no cover crops were grown but which received the same quantity and kind of fertilizer produced only 199 pounds of nuts an acre.

In most districts growers made the important mistake of planting the trees too close together and later failed to remove the excess trees at the proper time. Of 1,172 blocks of pecan trees approximately 36 percent of those that were 20 years old and older were planted at the heavy rate of 18 or more trees to the acre. After a period of 20 or more years 21 percent of these orchards still had not been thinned.

Where pecan trees have begun to crowd, there is probably no other practice of so much importance as thinning the stand of trees so that the ones remaining have an adequate volume of soil in which the roots can feed and adequate space for the proper development of the top. This is illustrated by an experiment in the Albany district of Georgia in which a block of trees in an orchard originally planted 20 trees to the acre was thinned to a stand of 10 trees to the acre. During the following 5 years the average annual yield of the thinned trees was more than double that of the unthinned ones. Furthermore, the nuts produced by the thinned trees were larger in size, better filled and commanded a higher price per pound than those from the unthinned trees. In addition, after thinning, the cost per acre of spraying and fertilizing was reduced by about one-half.

Insects and diseases of pecans have become rather widespread throughout the pecan region and cause large losses almost every year. In spite of disease-reduced yields, few growers make a serious effort to control diseases and insects by orchard sanitation and spraying. Only in the Orangeburg district of South Carolina, and the Fort Valley-Montezuma-Americus, district of Georgia, was any appreciable amount of spraying done. Even in these districts most of the spraying was for the control of scab on the Schley variety and other varieties were left unsprayed, although foliage diseases caused premature defoliation and thereby prevented the nuts from filling properly. Thus the prospects of a crop the following year were adversely affected.

The investment in a pecan orchard is rather large and annual production costs are appreciable. Insect and disease control is crop insurance and should be practiced by more growers. Proper orchard sanitation is effective in reducing the amount of disease infection and insect infestation. This practice combined with an adequate spray program will effectively control most insects and diseases affecting pecans. The results that may be expected from following out such a program are illustrated by an experiment conducted at Albany, Ga. in an orchard originally planted 20 trees to the acre but which had been thinned to a stand of 10 trees an acre in 1936. An adequate fertilizer, cover-crop and cultural program was uniformly carried out on all trees. On a part of this orchard a disease- and insect-control program was followed. During the 5-year period 1935-39 these trees produced nearly 400 percent more nuts than the unsprayed trees. In addition, owing to the poor quality of the nuts from the unsprayed trees, they sold for an average price of 7 cents a pound, while the high-quality nuts from the sprayed trees averaged 15 cents a pound.

Pecan trees of the varieties generally planted do not come into commercial bearing until they are about 10 years old, although they may produce some nuts earlier. Furthermore, the study shows that yields per tree of bearing orchards are generally very low, and, contrary to general opinion, there is no outstanding tendency for production to increase with the age and size of the trees. Yields are dependent on other factors than age or size of tree, such as fertility of soil, variety, crowding of trees, damage from insects and disease, and the orchard-management practices followed. Observations and studies show that in most cases the outstanding reasons for yields not increasing with the age and size of tree are crowding and damage caused by insects and diseases that, if uncontrolled, due to lack of efforts to keep them under control, tend to increase with the age of the orchard. Pecan trees are not only gross feeders but their root systems are usually spread from 2 to 2½ times that of the length of the branches, so that the roots are crowding long before the size of the tree tops indicate lack of space Under such conditions, tree growth is reduced and the trees become weak and unable to mature a normal crop of nuts. In addition they are more susceptible to injury by fungi and from attacks by insects. Where orchard sanitation and spraying measures are not practiced the population of these pests tends to increase from year to year until most if not all of the crop is destroyed.

The cost of developing an orchard to bearing age was in connection with an interplanted cash or feed crop for harvest. The method of cost analysis used assumes that the growing of these intercrops for harvest includes the cost of certain items required in developing the trees in proportion to the land acreage used by the crops grown in the orchard. The evidence would seem to prove that it is good economy to grow intercrops in the young orchard until the space occupied by this crop is needed for the well-being of the mature orchard.

The cost of operating bearing orchards of improved varieties, including interest charges, varied among districts from about $14.50 to $25.00 an acre. The pounds of pecans required to pay costs, including interest charges, ranged from approximately 105 to 205 pounds an acre. These cost differences are due to a number of reasons, such as wages of man labor, horse-work rates, use of fertilizer, and amount of the joint costs. The latter is the greatest factor. A considerable portion of these costs however does not represent actual cash. This is particularly true on farms on which there are enterprises other than pecans, such as the Fort Valley-Montezuma-Americus district of Georgia. The pecan farms in this district are relatively large and substantial acreages of cotton, corn and peanuts are grown in pecan orchards during the development stage as well as on acreage not in orchard. In addition, a substantial acreage of peaches is represented. On farms of this class much of the man labor, use of implements, and power on the pecan enterprise represents additional use of these things not provided for by the other farm enterprises and therefore should not be considered as additional actual costs to the farmer.

Throughout the study it was evident that one of the chief factors determining the success of the pecan enterprise is the managerial ability of the operator. In all districts studied the most successful orchards were those operated as a part of a diversified farming enterprise by men who understood farming operations and the growing of horticultural crops. Successful orchardists have also realized the desirability of planting trees only on fertile land and of maintaining that fertility to meet the requirements of the pecan tree.

The better growers in the region have fully appreciated the importance of carrying out most practices, at the time and in a way that would result in the maximum return for the effort and money expended. Too few were found, however, who made an adequate effort to control insects and diseases in their orchards, or to maintain the fertility of the soil through the growing of well-fertilized winter-legume cover crops and to practice the cultivation required.

In certain districts a considerable number of the orchards were owned by absentee owners who contracted for the work done in them or employed caretakers. Almost without exception such orchards had high production costs and were commercially unsuccessful. This was due in large measure to a lack of proper knowledge on the part of the owner as regards the production requirements of pecan trees and the high cost of carrying out the necessary practices.